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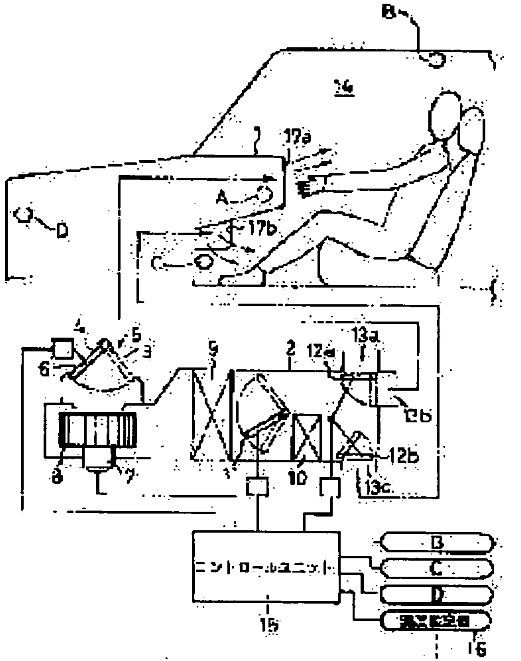
(54) AIR CONDITIONING CONTROL DEVICE FOR VEHICLE

(57)Abstract:



PROBLEM TO BE SOLVED: To provide an occupant with a comfortable warm and cool feeling by using temperature detected by a temperature sensor on the side of higher correlation with a warm and cool feeling of the occupant as temperature in a car room out of two of the temperature sensors to detect air temperature of upper and lower parts of the car room in case when it is discriminated as in case of air conditioning transition.

SOLUTION: Various kinds of doors 6, 11, 12a, 12b, an air blower 8, etc., are controlled to converge car room inside temperature to target temperature by inputting output signals of upper and lower part temperature sensors B, C, an outside air temperature season D, a temperature setter 16, etc., to a control unit 15 and computing necessary blowout temperature according to the input signals here. At this time, a difference between the upper and lower part temperature and the target temperature and a difference between the upper and lower temperature are computed, and when the differences are large, it can be judged as it is a primary transient time of air conditioning, and in a ventilation mode, correlation of temperature in a periphery of a heat part and a warm and cool feeling of an occupant becomes higher, and accordingly, temperature from the upper part temperature sensor B is specified as the car room inside temperature, and further airconditioning control is carried out accordingly.

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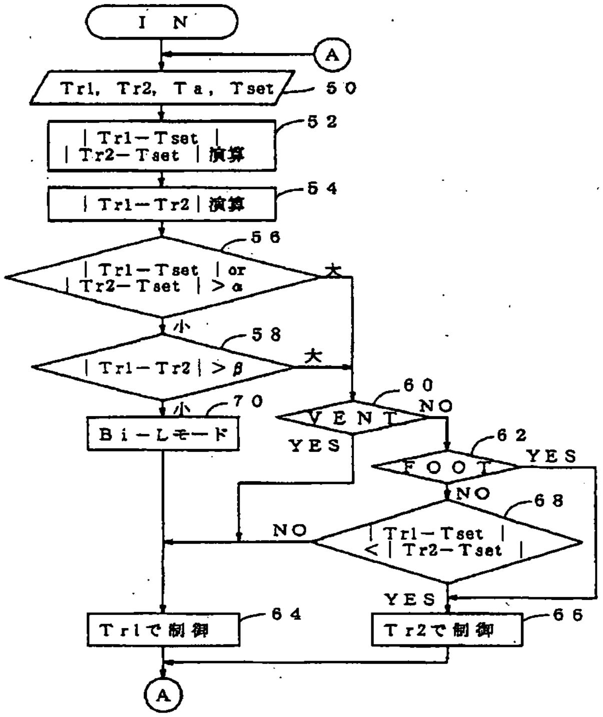
(54)【発明の名称】車両用空調制御装置

(57)【要約】

【課題】　過渡時と定常時とで適切に室内温度情報を収集し、快適な温冷感を乗員に与えることができる車両用空調制御装置を提供する。

【解決手段】　車室内上部の空気温度を検出する上部温度センサと足元の空気温度を検出する下部温度センサとを設け、車室内が温調過渡時である場合に、上部温度センサと下部温度センサのうち、乗員の温熱感との相関が高い側の温度センサによって検出された温度を車室内温度として用いる。車室内が温調定常時である場合には、上部温度センサによって検出された温度を車室内温度として用いる。



【特許請求の範囲】

【請求項１】　乗員の下半身に空気を吹き出す下部吹出口と、乗員の上半身に空気を吹き出す上部吹出口とを有し、車室内温度を含む環境情報を制御ユニットに入力し、予め与えられたプログラムにより前記環境情報に応じて吹出空気温度を調節し、選択された前記吹出口から温調空気を車室に供給するようにした車両用空調装置において、
車室上部の空気温度を検出する第１の温度センサと車室下部の空気温度を検出する第２の温度センサと、
車室内が空調過渡時にあるとみなす条件にあるか空調定常時にあるとみなす条件にあるかを判別する空調状態判別手段と、
前記判別手段によって前記空調過渡時にあると判別された場合に、前記第１及び第２の温度センサのうち、乗員の温冷感との相関が高い側の温度センサによって検出された温度を前記車室内温度として用い、前記判別手段によって前記空調定常時であると判別された場合に、前記第１の温度センサによって検出された温度を前記車室内温度として用いる温度情報切替手段とを備えたことを特徴とする車両用空調制御装置。

【請求項２】　前記空調状態判別手段は、前記第１の温度センサと前記第２の温度センサとによって検出されたそれぞれの温度の差が所定値以上である場合に空調過渡時にあるとみなし、前記所定値より小さい場合に空調定常時にあるとみなす請求項１記載の車両用空調制御装置。

【請求項３】　前記空調状態判別手段は、前記第１の温度センサ又は第２の温度センサとによって検出された温度の変化率が所定値以上である場合に空調過渡時にあるとみなし、前記所定値より小さい場合に空調定常時にあるとみなす請求項１記載の車両用空調制御装置。

【請求項４】　前記空調状態判別手段は、温調制御が開始されてから所定時間経過するまでの間を空調過渡時にあるとみなし、前記所定時間経過後を空調定常時にあるとみなす請求項１記載の車両用空調制御装置。

【請求項５】　車室内の目標温度を設定する温度設定部を有し、前記第１の温度センサによって検出された温度と前記温度設定部によって設定された温度との差、又は、前記第２の温度センサによって検出された温度と前記温度設定部によって設定された温度との差が所定値以上である場合に温調過渡時にあるとみなし、前記所定値より小さい場合に温調定常時にあるとみなす請求項１記載の車両用空調制御装置。

【請求項６】　前記上部吹出口と下部吹出口とがベントモードを形成する開度に設定されている状態で前記空調状態判別手段によって空調過渡時にあると判別されると、前記第１の温度センサによって検出された温度を前記車室内温度として用い、前記上部吹出口と下部吹出口とがフットモードを形成する開度に設定されている状態で前記空調状態判別手段によって空調過渡時にあると判別されると、前記第２の温度センサによって検出された温度を前記車室内温度として用いる請求項１記載の車両用空調制御装置。

【請求項７】　車室内の目標温度を設定する温度設定部を有し、前記上部吹出口と下部吹出口とがベントモード又はフットモード以外のモードを形成する開度に設定されている場合に、前記空調状態判別手段によって空調過渡時にあると判別されると、前記第１の温度センサによって検出された温度と前記目標温度との差が前記第２の温度センサによって検出された温度と前記目標温度との差より小さい場合に前記第２の温度センサによって検出された温度を前記車室内温度として用い、大きい場合に前記第１の温度センサによって検出された温度を前記車室内温度として用いる請求項６記載の車両用空調制御装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】この発明は、車室内温度を含む環境情報をコントロールユニットに入力し、予め与えられたプログラムにより空調機器を制御して車室内を温調制御する車両用空調制御装置に関する。

【０００２】

【従来の技術】従来の車両用空調制御装置は、車室内温度を検出する室内温度センサをダッシュボード内に配置するようにしたものが一般的であり、例えば、特開平１－２６９６４６号公報や実公昭５７－１４０８７号公報等にあっては、ダッシュボード内に設けられたアスピレータの吸気通路上流側に室内温度センサを設け、アスピレータにて吸引される車室内の空気を常時室内温度センサの周囲に流動させることで室温を適切に検出し、この検出結果を空調制御に利用するようにした点が開示されている。

【０００３】また、特開昭５５－１４３３４５号公報には、車室の上部と下部の温度をそれぞれ検出してコントロールユニットに入力し、コントロールユニットは予め決められたプログラムに従って上部温度と下部温度との重み付けを吹出モードに応じて異ならせて代表室温を合成し、この合成値に基づいて空調機器を制御することで車室内を温調制御するようにした車両用空調制御装置が開示されている。

【０００４】

【発明が解決しようとする課題】しかしながら、ダッシュボードに１つの温度センサを設置する構成では、車室内の温度分布にばらつきがあっても、ダッシュボード近辺の温度（乗員の腹部周辺の温度）で車室内温度が代表されることとなるので、この温度で空調機器が制御されると空調初期の過渡時だけでなく定常時においても乗員の温冷感にマッチした空調制御が必ずしも行えるとはいえない。

【０００５】例えば、冷房時のベントモード（上部吹出）を考えると、冷房初期の過渡時にあっては、車室の頭部周辺（図１のＢ位置）、腹部周辺（ダッシュボード付近を示す図１のＡ位置）、脚部周辺（図１のＣ位置）の温度が図５で示されるように変化する。即ち、頭部周辺の温度が最も早く下がり、次いで腹部周辺の温度が早く下がり、脚部周辺の温度は最も遅く下がってくる。

【０００６】このような過渡時での温度と乗員の温冷感との相関関係を調べるために、多数の被験者から温冷感に関する評価値を計測し、これを吹出モード別に被験者間での値をYi ＝（Xｉ－X'ｉ）／σｉ で規準化し、その平均値を用いた相関係数によって評価すると、図６の絶対値表記された相関係数（ＬＨ，ＭＨ）から判るように、頭部周辺の温度が乗員の温冷感と最も相関が高く、吹出空気が低速風量であれば、脚部周辺が次いで高くなり、腹部周辺は最も相関が低くなる。また、中速風量であれば、頭部、腹部、脚部の順で相関が低くなる。いずれにしても、乗員の温冷感は頭部周辺の温度と相関が最も高い。尚、規準化に用いた式中、Yiは被験者ｉのＸｉの規準化した値、Ｘｉは被験者ｉの評価値、X'ｉは被験者ｉの各条件における評価値の平均値、σｉ は被験者ｉの各条件における評価値の標準偏差をそれぞれ示す。また、図６で示される相関関係は、冷房、暖房に関係のない吹出モード別の相関を示している。

【０００７】同様に、暖房時のフットモード（下部吹出）にあっては、図５に示されるように、暖房初期では、脚部周辺の温度が最も早く上がり、次いで腹部周辺の温度が早く上がり、頭部周辺の温度が最も遅く上がってくる。この場合の過渡時での乗員の温冷感との相関関係は、図６の実験結果から判るように、脚部周辺温度が最も相関が高く、頭部周辺の温度が次いで高くなり、腹部周辺の温度は最も相関が低くなる。

【０００８】このため、ダッシュボード近辺の温度（腹部周辺温度）を空調過渡時の制御に用いる場合ことは、ともすれば乗員の温冷感との相関が最も低い箇所の温度で制御することとなり、乗員の温冷感を度外視した制御が行われてしまうものであった。

【０００９】車室内温度、車室外温度、目標温度等の因子から車室内温度を目標温度に収束させるための必要吹出温度が演算されるオートエアコンにあっては、必要吹出温度が高いほど暖房の要請が高いので吹出モードをフットモードとし、低くなるにつれて、バイレベルモード、ベントモードへと吹出モードを切り換える制御が行われる（図７参照）。このため、自動空調制御での冷房初期においてはベントモードとなり、暖房初期にはフットモードとなるのが通常であるが、図５においては、冷房初期に吹出モードがバイレベルモード、デフフットモード、フットモードに設定される場合や、暖房初期に吹出モードがベントモード、バイレベルモード、デフフットモードに設定される場合の各箇所の温度変化も示されている。

【００１０】結局、これらを総括すると、過渡時での相関関係は、図８に示されるように、冷房、暖房を問わず、ベントモードでは頭部周辺温度が乗員の温冷感と相関が最も高くなり、フットモードでは、脚部周辺温度が乗員の温冷感と相関が最も高くなることが判る。尚、図８の過渡時におけるベントモードは、図６のＬＨに対応させたものであるが、ＭＨの場合においても、ＡとＣの相関の順序が入れ替わるだけで頭部周辺温度が乗員の温冷感と相関が最も高くなることに変わりはない。また、過渡時のフットモードは、ＬＬに対応させたものであるが、ＭＬで表しても、相関の順序に変わりはない。

【００１１】また、空調が開始されてから十分時間が経過した場合にあっても、冷房時を例にとると、図９（ａ）に示されるように、ダッシュボードに温度センサが設置される従来の空調装置では、ラインＡで示されるように温度センサの検出温度が目標温度Tset に収束するよう制御されるが、吹出モードがベントモードとなっていれば、頭部の温度は目標温度より低くなり、フットモードとなっていれば、脚部が冷え過ぎとなる。

【００１２】同様に、暖房時にあっても、図９（ｂ）に示されるように、吹出モードがベントモードになっていれば、頭部の温度は目標温度より高くなり、フットモードになっていれば、脚部が温め過ぎとなる。

【００１３】このように、ダッシュボードの温度センサＡで制御した場合には、定常時にあっても頭部や脚部の温度が目標温度から外れることに起因する不快感が存在することを示している。

【００１４】これに対して、後者の従来技術にあっては、車室上部と下部の温度を検出している点で、車室温度の上下温の差を考慮しているものであるが、上部吹出と下部吹出とで重み付けを変えて合成信号を形成し、これに基づいて空調装置を制御する構成となっているに過ぎず、上述した空調過渡時と定常時の両方において、乗員の温冷感にマッチした温調制御が必ずしも行えているとはいえない。

【００１５】即ち、過渡時では、吹出モード毎に重み付けを変えて室内温度を決定することは、上述の結論（ベントモードでは上部温度が温冷感と相関が高く、フットモードでは下部温度が温冷感と相関が高い）に対応できるものと思われるが、定常時にあっては、図８に示されるように、吹出モードに関係なく頭部周辺の温度と乗員の温冷感との相関が最も高くなることが確認されている。つまり、定常時にあっては、吹出モード毎に重み付けを変えて室内温度を決定することで果たして乗員が快適と感じる温調を実現できるか疑問が残る。

【００１６】そこで、本発明においては、空調過渡時においても、定常時においても、乗員が快適と感じる温調制御を行うには、従来の車室内温度の検出形態と異なる新たなやり方が必要となることから、過渡時と定常時と

で適切に室内温度情報を収集し、より快適な温冷感を乗員に与えることができる車両用空調制御装置を提供することを課題としている。

【００１７】

【課題を解決するための手段】本発明者は、上述の如く、空調過渡時においては、ベントモードであれば冷暖房を問わず頭部周辺温度と乗員の温冷感との相関が高く、フットモードであれば冷暖房を問わず脚部周辺温度と温冷感との相関が高くなり、また、空調定常時（頭部周辺温度と脚部周辺温度との差、頭部周辺温度と目標温度との差、又は脚部周辺温度と目標温度との差が小さくなる状態）においては、吹出モードに係わらず頭部周辺温度と温冷感との相関が高くなるという知見に基づき、本発明を完成するに至った。また、本発明者は、バイレベルモードにおいて、頭部周辺温度と目標温度との差が脚部周辺温度と目標温度との差より小さい場合には、脚部周辺温度と温冷感との相関が高くなるという知見からも本発明を構築するに至った。

【００１８】即ち、本発明にかかる車両用空調制御装置は、乗員の下半身に空気を吹き出す下部吹出口と、乗員の上半身に空気を吹き出す上部吹出口とを有し、車室内温度を含む環境情報を制御ユニットに入力し、予め与えられたプログラムにより前記環境情報に応じて吹出空気温度を調節し、選択された前記吹出口から温調空気を車室に供給するものに係り、車室上部の空気温度を検出する第１の温度センサと車室下部の空気温度を検出する第２の温度センサと、車室内が空調過渡時にあるとみなす条件にあるか空調定常時にあるとみなす条件にあるかを判別する空調状態判別手段と、前記判別手段によって前記空調過渡時にあると判別された場合に、前記第１及び第２の温度センサのうち、乗員の温冷感との相関が高い側の温度センサによって検出された温度を前記車室内温度として用い、前記判別手段によって前記空調定常時であると判別された場合に、前記第１の温度センサによって検出された温度を前記車室内温度として用いる温度情報切替手段とを備えたことを特徴としている（請求項１）

【００１９】このような制御装置によって実現される制御方法は、車室内が空調過渡時にあるとみなす条件にあるか空調定常時にあるとみなす条件にあるかを判別する工程と、前記判別工程によって前記空調過渡時にあると判別された場合に、前記第１及び第２の温度センサのうち、乗員の温冷感との相関が高い側の温度センサによって検出された温度を前記車室内温度として用いる工程と、前記判別工程によって前記空調定常時であると判別された場合に、前記第１の温度センサによって検出された温度を前記車室内温度として用いる工程とを含むものであり、実際には、車室内が空調過渡時にあるとみなす条件にあるか空調定常時にあるとみなす条件にあるかを判別させ、空調過渡時にあると判別された場合に、前記第１及び第２の温度センサのうち乗員の温冷感との相関が高い側の温度センサによって検出された温度を入力し、空調定常時であると判別された場合に、前記第１の温度センサによって検出された温度を車室内温度として入力するプログラムが記憶された媒体をコンピュータに備えることによって実現される。

【００２０】したがって、空調過渡時においては、第１及び第２の温度センサのうち、乗員の温冷感との相関が高い側の温度センサによって検出された温度信号が制御ユニットに入力され、予め与えられたプログラムによって吹出空気温度が調節され、この温調された空気が選択された吹出口から車室へ供給される。

【００２１】空調状態判別手段は、第１の温度センサと第２の温度センサとによって検出されたそれぞれの温度の差が所定値以上である場合に温調過渡時にあるとみなし、前記所定値より小さい場合に空調定常時にあるとみなすようにしても（請求項２）、第１の温度センサ又は第２の温度センサとによって検出された温度の変化率が所定値以上である場合に空調過渡時にあるとみなし、前記所定値より小さい場合に空調定常時にあるとみなすようにしても（請求項３）、温調が開始されてから所定時間経過するまでの間を空調過渡時にあるとみなし、前記所定時間経過後を空調定常時にあるとみなすようにしてもよい（請求項４）。

【００２２】さらに、車室内の目標温度を設定する温度設定部を有し、前記第１の温度センサによって検出された温度と前記温度設定部によって設定された温度との差、又は、前記第２の温度センサによって検出された温度と前記温度設定部によって設定された温度との差が所定値以上である場合に温調過渡時にあるとみなし、前記所定値より小さい場合に温調定常時にあるとみなすようにしてもよい（請求項５）。

【００２３】温度センサは、車室内の上部又は下部の温度が実質的に検出できればよく、通常のサーミスタを用いても、赤外線センサ、ＩＣ温度センサ、感温フェライト等を用いてもよい。

【００２４】前記第１及び第２の温度センサのうち、乗員の温冷感との相関が高い側の温度センサによって検出された温度を前記車室内温度として用いるとは、上部吹出口と下部吹出口とがベントモードを形成する開度に設定されている状態で前記空調状態判別手段によって空調過渡時にあると判別されると、前記第１の温度センサによって検出された温度を前記車室内温度として用い、前記上部吹出口と下部吹出口とがフットモードを形成する開度に設定されている状態で前記空調状態判別手段によって空調過渡時にあると判別されると、前記第２の温度センサによって検出された温度を前記車室内温度として用いることであり（請求項６）、さらに、上部吹出口と下部吹出口とがベントモード又はフットモード以外のモードを形成する開度に設定されている場合に、前記空調

状態判別手段によって空調過渡時にあると判別されると、前記第１の温度センサによって検出された温度と前記目標温度との差が前記第２の温度センサによって検出された温度と前記目標温度との差より小さい場合に前記第２の温度センサによって検出された温度を前記車室内温度として用い、大きい場合に前記第１の温度センサによって検出された温度を前記車室内温度として用いることをいう（請求項７）。

【００２５】したがって、空調過渡時にベントモードであれば、冷暖、暖房に関わらず乗員の温冷感との相関が高い第１の温度センサの出力が用いられ、その後、定常時に移行しても第１の温度センサの出力が用いられる。これに対して、空調過渡時にフットモードであれば、冷暖、暖房に関わらず乗員の温冷感との相関が高い第２の温度センサの出力が用いられ、その後、定常時に移行すると、相関の高い第１の温度センサの出力が用いられる。

【００２６】また、空調過渡時がベントモード又はフットモード以外のモードであれば、第１の温度センサによって検出された温度と目標温度との差が第２の温度センサによって検出された温度と目標温度との差より小さい場合に第２の温度センサの出力が乗員の温冷感と相関が高くなることからこの出力が用いられ、逆に大きい場合には、第１の温度センサの出力が乗員の温冷感と相関が高くなることからこの出力が用いられる。そして、定常時に移行すると、相関の高い第１の温度センサの出力が用いられる。

【００２７】

【発明の実施の形態】以下、この発明の実施の形態を図面により説明する。図１において、車両用空調制御装置は、車両のダッシュボード１の内側に配置されているものを想定しており、空調ケース２の最上流側に内気導入口３と外気導入口４とを有するインテーク切替装置５が設けられ、内気と外気との導入割合がインテークドア６によって調節されるようになっている。空調ダクト２には、モータ７によって回転する送風機８が前記導入口に臨むように設けられ、送風機８の回転によって導入口から空気を吸引し、下流側へ圧送するようになっている。

【００２８】送風機８の下流側には、エバポレータ９が配され、このエバポレータ９は、図示しないコンプレッサ、コンデンサ、リキッドタンク、エクスパンションバルブ等と共に配管結合されて冷房サイクルを構成しており、コンプレッサの稼動によりエバポレータ９へ冷媒を供給してこのエバポレータ９を通過する空気を冷却するようになっている。

【００２９】エバポレータ９の下流側には、エンジン冷却水を熱源とするヒータコア１０が配置されており、このヒータコア１０の手前にエアミックスドア１１が配されている。エバポレータ９を通過した空気は、このエアミックスドア１１によってヒータコア１０を通過する空気とこれをバイパスする空気との割合が調節されるようになっている。

【００３０】そして、エバポレータ９及びヒータコア１０によって温調された空気は、空調ダクト２の最下流側に設けられたモードドア１２ａ，１２ｂによって開閉される吹出口（デフ吹出口１３ａ、ベント吹出口１３ｂ、フット吹出口１３ｃ）から車室１４へ送風されるようになっている。ここで、乗員の上半身へ空気を供給するベント吹出口１３ｂが乗員の上半身へ空気を供給する上部吹出口１７ａに、足元へ空気を供給するフット吹出口１３ｃが乗員の足元へ空気を供給する下部吹出口１７ｂにそれぞれ連通している。

【００３１】上述した各空調機器は、コントロールユニット１５からの制御信号によって駆動制御されるようになっており、このコントロールユニット１５は、ＣＰＵ、ＲＯＭ、ＲＡＭ等を備えたマイクロコンピュータや信号の入出力ポート等を備え、予め与えられた所定のプログラムに基づいて各種入力信号を制御信号に変換し、各空調機器を制御するようになっている。

【００３２】即ち、車室上部の温度（Tr1）を検出する上部温度センサＢ、車室下部の温度（Tr2）を検出する下部温度センサＣ、外気温（Ｔａ）を検出する外気温度センサＤ、車室内の目標温度（Tset ）を設定する温度設定器１６等の信号をコントロールユニット１５に入力し、ここで入力された各種信号に基づいて必要吹出温度Ｔｏを演算し、目標温度（Tset ）に車室内温度が収束するよう各種ドア６、１１、１２ａ、１２ｂや送風機８等を駆動制御するようになっている。ここで、上部温度センサＢは、天井等の乗員の頭部に近い位置に配置され、下部温度センサＣは、ダッシュパネル下方のフット吹出口１３ｃ近傍に配置すればよい。

【００３３】図２にコントロールユニット１５によって各空調機器を制御する動作例、特に目標吹出温度を演算するまでの過程がフローチャートとして示され、コントロールユニット１５は、空調装置の稼働後にこの処理ルーチンに入り、車室上部温度（Tr1）、下部温度（Tr2）、外気温（Ｔａ）、目標温度（Tset ）等の各種情報を入力する（ステップ５０）。

【００３４】この各種入力情報は、オートエアコンの各オート制御で用いられることとなるが、目標吹出温度を演算する工程では、上部温度と目標温度との差（｜Tr1－Tset ｜）、及び下部温度と目標温度との差（｜Tr2－Tset ｜）を演算すると共に、上部温度と下部温度との差（｜Tr1－Tr2｜）を演算する（ステップ５２、５４）。

【００３５】上部温度と目標温度との差（｜Tr1－Tset ｜）又は下部温度と目標温度との差（｜Tr2－Tset ｜）が大きい場合には、車室内温度が目標温度に十分に収束していない空調初期の過渡時であると言えることから、所定値αを境に前記差がこれより大きい場合には過

渡時と判別し、α以下であればさらに上部温度と下部温度との差（｜Tr1－Tr2｜）によって空調過渡時であるか定常時であるかを判別する（ステップ５６）。

【００３６】上部温度と下部温度との差が小さい場合には、車室内温度が目標温度に収束した空調定常時であると言えることから、所定値βを境に｜Tr1－Tr2｜がこれ以下であれば定常状態となったとみなし、βより大きければ、依然として過渡状態にあると判別する（ステップ５８）。

【００３７】過渡時と判別された場合には、現在の吹出モードがベントモードか、フットモードか、それ以外のモード（バイレベルモード等）かを判定し（ステップ６０、６２）、ベントモードであると判定された場合には、頭部周辺の温度が乗員の温冷感と相関が高くなることから、上部温度センサＢからの温度（Tr1）をもって車室内温度とし、以後の空調制御を行う。即ち、必要吹出温度ＴｏをＴｏ＝ｆ（Tr1，Ｔａ，Tset，・・・）として演算し、Tr1が目標温度Tset に収束するよう各種ドア６、１１、１２ａ、１２ｂや送風機８等を駆動制御する（ステップ６４）。

【００３８】これに対して、過渡時にフットモードであると判定された場合には、脚部周辺の温度が乗員の温冷感と相関が高くなることから、下部温度センサＣからの温度（Tr2）をもって車室内温度とし、以後の空調制御を行う。即ち、必要吹出温度ＴｏをＴｏ＝ｆ（Tr2，Ｔａ，Tset，・・・）として演算し、Tr2が目標温度Tset に収束するよう各種ドア６、１１、１２ａ、１２ｂや送風機８等を駆動制御する（ステップ６６）。

【００３９】また、吹出モードがバイレベルモード等のベントモードやフットモード以外のモードであると判定された場合には、以下のように処理される。先ず、バイレベルモードの過渡時にあっては、上部温度と目標温度との差（｜Tr1－Tset ｜）が下部温度と目標温度との差（｜Tr2－Tset ｜）より小さければ下部温度と乗員の温冷感との相関が高くなり、逆であれば、上部温度と乗員の温冷感との相関が高くなることが判っているから、ステップ６８へ進み、｜Tr1－Tset ｜＜｜Tr2－Tset ｜であると判定されれば、下部温度センサＣからの温度（Tr2）をもって車室内温度とし、逆であれば、上部温度センサＢからの温度（Tr1）をもって車室内温度とする。

【００４０】これにより、過渡時では、吹出モードに応じて乗員の温冷感と相関の高い部分の温度によって車室が温調され、その部分の温度が目標温度に向かって収束されていくので、快適な温冷感を乗員に与えることができる。

【００４１】空調が進んで、それぞれの吹出モードで選択された温度センサの出力が目標温度に収束し、ステップ５８で｜Tr1－Tr2｜がβ以下となる定常時になると、吹出モードがバイレベルモードに切り替わり（ステップ７０）、定常時において乗員の温冷感と最も相関が高くなる上部温度との関係で以後の制御が行われる。即ち、必要吹出温度ＴｏをＴｏ＝ｆ（Tr1，Ｔａ，Tset，・・・）として演算し、Tr1が目標温度Tset への収束を維持するように各種ドア６、１１、１２ａ、１２ｂや送風機８等を駆動制御する。

【００４２】上記構成において、過渡時にベントモードに設定されている場合には、定常時に至るとバイレベルモードとなるが、この場合には、過渡時、定常時に関わらず上部温度Tr1を車室内温度として空調制御する。また、過渡時にフットモードに設定されていれば、この過渡時では下部温度Tr2を車室内温度として空調制御されるが、定常時になると、吹出モードがバイレベルモードに切り替わると共に、使用される温度センサも上部温度センサＢに切り替わり、上部温度Tr1を車室内温度として空調制御される。

【００４３】そして過渡時がバイレベルモードであれば、この過渡時では乗員の温冷感との相関の高い側の温度が車室内温度として空調制御に用いられ、定常時に移行した時点で、吹出モードの切り換えはないが、上部温度Tr1によってのみ空調制御されることとなる。

【００４４】したがって、過渡時のみならず定常時においても、乗員の温冷感と最も相関が高くなる部分の温度を参照しつつ空調制御が行われるので、乗員の温冷感を常時損なうことがなくなる。

【００４５】また、定常時には、過渡時がいかなる吹出モードに設定されていてもバイレベルモードに設定されるので、吹出モードが切り換えられることによって乗員の温冷感が変わると目標温度等の変更操作が行われうるが、上記構成においては、温度センサが適切に切り換えられることによって乗員の温冷感が損なわれないため、目標温度等の変更操作は不要となり、乗員の空調装置を制御する煩わしさを低減することができる。

【００４６】尚、上述の構成例では、過渡時と定常時との判別を温度のファクタを利用して行うようにしたが、温度と時間、あるいは時間のみのファクタをもって判別するようにしてもよい。例えば、図３に示されるように、前記ステップ５４に代えて上部温度の変化率、又は下部温度の変化率を演算し（ステップ７２）、この変化率が大きい場合には車室内が目標温度に収束する初期の状態であり、小さい場合にはほぼ収束した状態であるとみることができるから、前記変化率が所定値γより大きい場合を過渡状態とみなし、小さい場合を定常状態とみなす判定を前記ステップ５８の判定に代替させるようにしてもよい（ステップ７４）。

【００４７】あるいは、図４で示されるように、タイマをスタートさせて空調装置の稼働時からの計時を行い（ステップ７６）、稼働時からの時間が長いほど車室内が目標温度に収束しているはずであるから、タイマが所定時間δを境にしてこれより短い場合を過渡状態とみな

し、長い場合を定常状態とみなす判定を前記ステップ５８の判定に代替させるようにしてもよい（ステップ７８）。

【００４８】これらの制御形態にあっても、温度のみをファクタとする制御と同様の作用効果が得られることはいうまでもないが、時間のみをファクタとする制御の場合には、車室内初期温度や吹出モード等によっては過渡状態から定常状態への適切な切り換え時間が異なることから、車室内初期温度や吹出モード等に応じて予め実験等で決められた時間δを割り当てることが望ましい。

【００４９】

【発明の効果】以上述べたように、この発明によれば、空調過渡時に第１及び第２の温度センサのうち、乗員の温冷感との相関が高い側の温度センサによって検出された温度信号が空調制御に用いられ、空調定常時であると判別された場合に、第１の温度センサによって検出された温度信号が空調制御に利用されるので、過渡時も定常時も乗員の温冷感と相関が高い温度信号で車室内が温調されることとなり、何時も適切に室内温度情報を収集して従来よりも快適な温冷感を乗員に与えることができる。

【００５０】また、第１及び第２の２つの温度センサで空調過渡時と定常時に対応できるので、車室上部と下部に温度センサが設けられている従来のハード構成であれば、制御ユニットのプログラムを変更すことのみで対応でき、また、通常のオートエアコンでは少なくとも１つの温度センサを備えているので、温度センサを追加するにしても１つ追加するだけで済み、ローコストで快適感の向上が図れる。

【００５１】また、乗員の温冷感との相関が高い側の温度センサが自動的に選択されて用いられるので、わざわざ空調過渡時から定常時への移行時に、或いは、吹出モードを切り換える度に乗員の感覚と実際の温調とがずれて空調装置の手動による設定変更を余儀なくされることが少なくなる。この結果、熱負荷に見合った適切な温調制御を実現でき、省エネを実現することができる。

【図面の簡単な説明】

【図１】図１は、この発明にかかる車両用空調制御装置のハード構成例を示す図である。

【図２】図２は、図１に示すコントロールユニットの制御作動例を示すフローチャートである。

【図３】及び

【図４】図３及び図４は、図１で示すコントロールユニットの他の制御作動例を示すフローチャートである。

【図５】図５は、冷房時と暖房時のそれぞれについて、吹出モード別に空調過渡時の温度変化の概略を示した特性線図である。

【図６】図６は、腹部周辺温度、頭部周辺温度、脚部周辺温度と乗員の温冷感との相関関係を示す実験データである。

【図７】図７は、オートエアコンの吹出モードと必要吹出温度との関係を示す特性線図である。

【図８】図８は、腹部周辺温度Ａ、頭部周辺温度Ｂ、脚部周辺温度Ｃと乗員の温冷感との相関関係の概略を空調過渡時と定常時のそれぞれについて吹出モード別に示したグラフである。

【図９】図９は、腹部周辺温度Ａを目標温度（２５°Ｃ）に収束させた場合の頭部周辺温度Ｂ及び脚部周辺温度Ｃの目標温度からのずれを示す特性線図である。

【符号の説明】

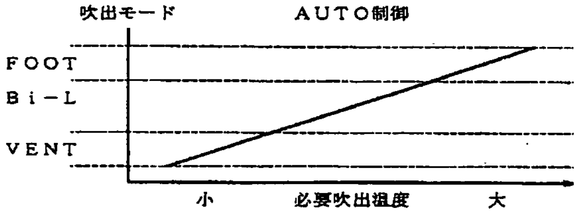
１５	コントロールユニット
１６	温度設定器
１７ａ	上部吹出口
１７ｂ	下部吹出口
Ｂ	上部温度センサ
Ｃ	下部温度センサ
Ｄ	外気温度センサ

【図６】

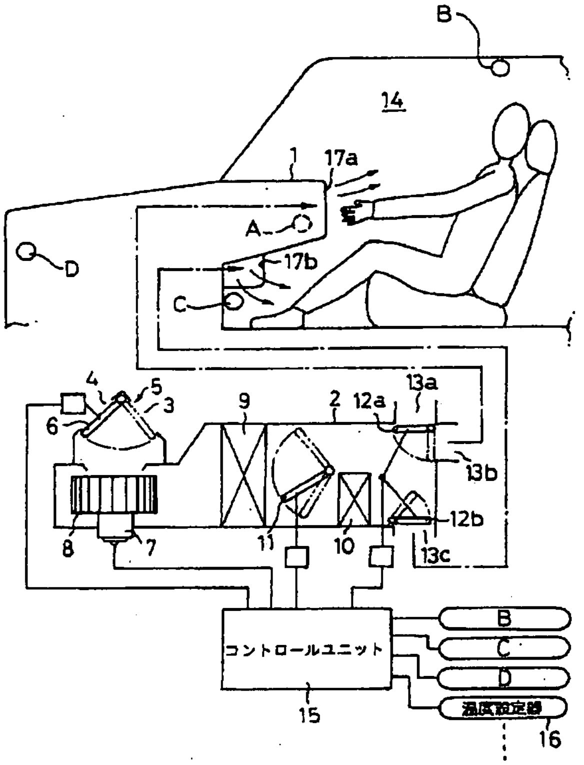
実験条件	Ｌ　Ｈ	Ｌ　Ｌ	Ｍ　Ｈ	Ｍ　Ｌ
腹部周辺温度	0.886	0.388	0.946	0.291
頭部周辺温度	0.983	0.851	0.995	0.828
脚部周辺温度	0.936	0.977	0.934	0.951

ＬＨ：低速風量、上部吹出
ＭＨ：中速風量、上部吹出
ＬＬ：低速風量、下部吹出
ＭＬ：中速風量、下部吹出

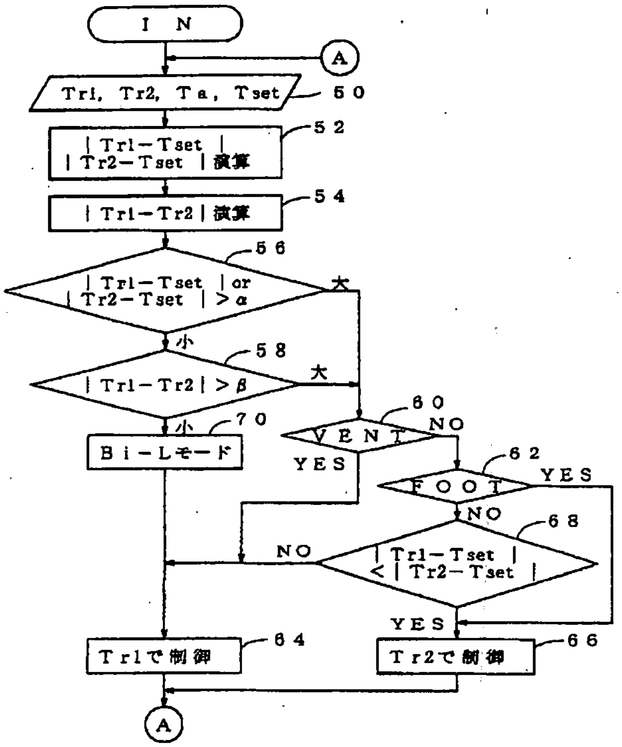
【図７】



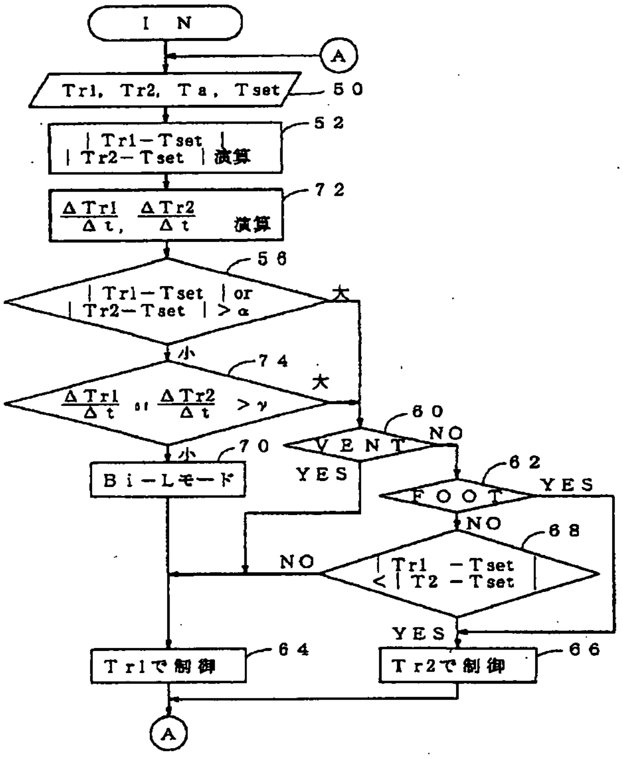
【図１】


B
A
D
C
コントロールユニット
B
C
D
温度設定器

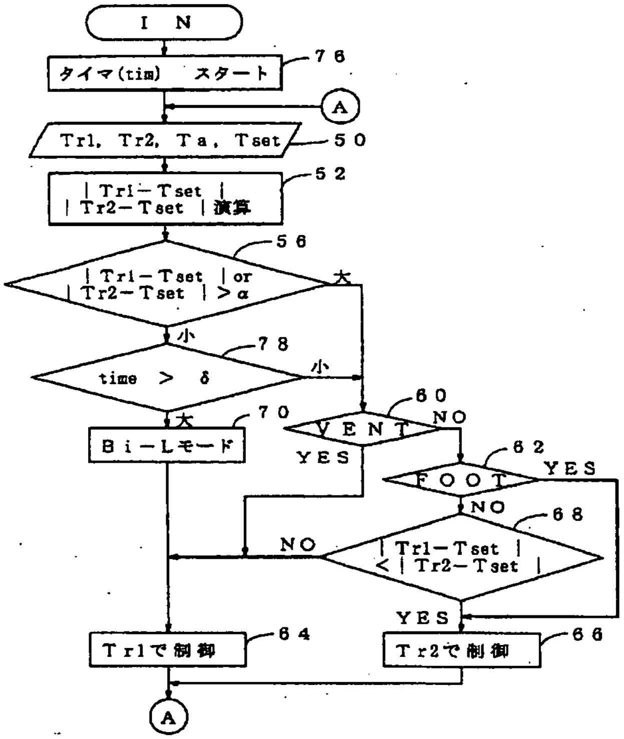
【図２】


I N
A
Tr1, Tr2, Ta, Tset
50
|Tr1−Tset|
|Tr2−Tset| 演算
52
|Tr1−Tr2| 演算
54
56
|Tr1−Tset| or
|Tr2−Tset| > α
大
小
58
|Tr1−Tr2| > β
大
小
70
Bi−Lモード
60
VENT
NO
YES
62
FOOT
YES
NO
68
|Tr1−Tset|
< |Tr2−Tset|
NO
YES
Tr1で制御
64
Tr2で制御
66
A

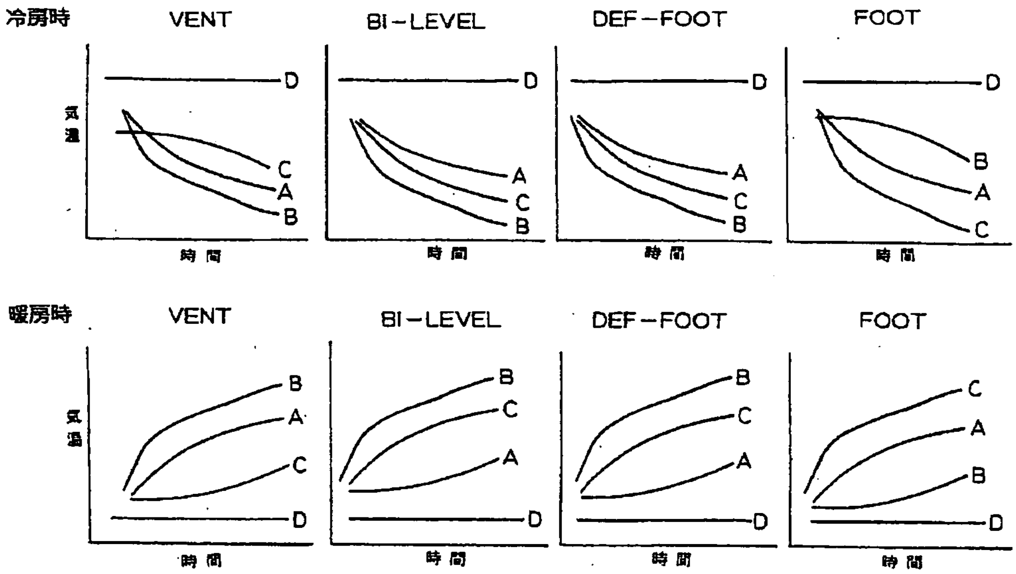
【図３】


I N
A
Tr1, Tr2, Ta, Tset
50
|Tr1−Tset|
|Tr2−Tset| 演算
52
ΔTr1/Δt, ΔTr2/Δt 演算
72
56
|Tr1−Tset| or
|Tr2−Tset| > α
大
小
74
ΔTr1/Δt or ΔTr2/Δt > γ
大
小
70
Bi−Lモード
60
VENT
NO
YES
62
FOOT
YES
NO
68
|Tr1 −Tset|
< |T2 −Tset|
NO
YES
Tr1で制御
64
Tr2で制御
66
A

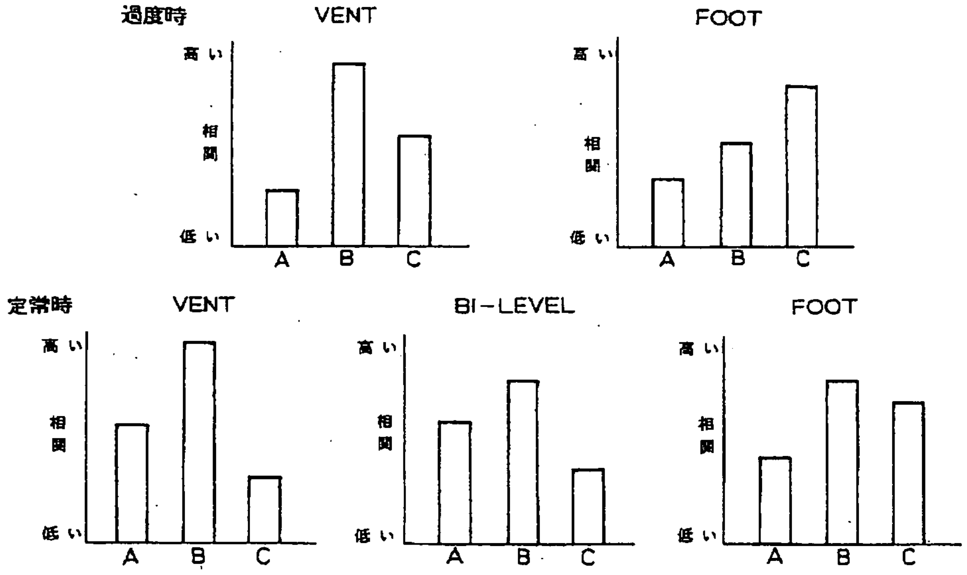
【図４】


I N
タイマ(tim) スタート
76
A
Tr1, Tr2, Ta, Tset
50
|Tr1−Tset|
|Tr2−Tset| 演算
52
56
|Tr1−Tset| or
|Tr2−Tset| > α
大
小
78
time > δ
小
大
70
Bi−Lモード
60
VENT
NO
YES
62
FOOT
YES
NO
68
|Tr1−Tset|
< |Tr2−Tset|
NO
YES
Tr1で制御
64
Tr2で制御
66
A

【図５】

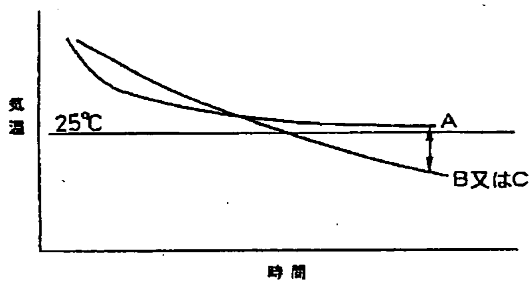

冷房時
VENT
BI－LEVEL
DEF－FOOT
FOOT
気温
D
C
A
B
D
A
C
B
D
A
C
B
D
B
A
C
時間
時間
時間
時間
暖房時
VENT
BI－LEVEL
DEF－FOOT
FOOT
気温
B
A
C
D
B
C
A
D
B
C
A
D
C
A
B
D
時間
時間
時間
時間

【図８】

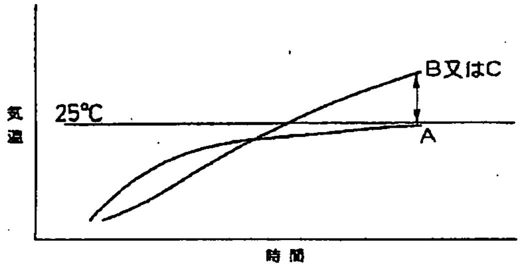

過度時
VENT
FOOT
高い
相関
低い
A
B
C
高い
相関
低い
A
B
C
定常時
VENT
BI－LEVEL
FOOT
高い
相関
低い
A
B
C
高い
相関
低い
A
B
C
高い
相関
低い
A
B
C

【図９】

(a)　冷房時(25° C設定)



(b)　暖房時(25° C設定)



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CLAIMS

[Claim(s)]

[Claim 1] It has the lower outlet which blows off air on crew's lower half of the body, and the up outlet which blows off air in crew's upper half of the body. In the air conditioner for cars which inputs environmental information including whenever [vehicle room air temperature] into a control unit, adjusts blow-off air temperature according to said environmental information by the program given beforehand, and supplied temperature control air to the vehicle room from said selected outlet The 1st temperature sensor which detects the air temperature of the vehicle room upper part, and the 2nd temperature sensor which detects the air temperature of the vehicle room lower part, An air-conditioning condition distinction means to distinguish whether it is in the conditions regarded as the vehicle interior of a room being in an air-conditioning transient, or it is in the conditions consider that are at the time of an air-conditioning stationary, When it was in said air-conditioning transient with said distinction means and is distinguished, the inside of said 1st and 2nd temperature sensors, The temperature at which correlation with crew's thermal sensation was detected by the temperature sensor of a high side is used as whenever [said vehicle room air temperature]. The air-conditioning control unit for cars characterized by having a temperature information change means using the temperature detected by said 1st temperature sensor as whenever [said vehicle room air temperature] when it is distinguished by said distinction means that it is at said air-conditioning stationary time.

[Claim 2] Said air-conditioning condition distinction means is an air-conditioning control unit for cars according to claim 1 considers that is in an air-conditioning transient when the difference of each temperature detected by said the 1st temperature sensor and said 2nd temperature sensor is beyond a predetermined value, and consider that is at the time of an air-conditioning stationary when smaller than said predetermined value.

[Claim 3] Said air-conditioning condition distinction means is an air-conditioning control unit for cars according to claim 1 considers that is in an air-conditioning transient when the rate of change of the temperature detected by said the 1st temperature sensor or 2nd temperature sensor is beyond a predetermined value, and consider that is at the time of an air-conditioning stationary when smaller than said predetermined value.

[Claim 4] Said air-conditioning condition distinction means is an air-conditioning control unit for cars according to claim 1 which considers that between after temperature control control is started until it carries out predetermined time progress is in an air-conditioning transient, and considers that said predetermined time progress back is at the time of an air-conditioning stationary.

[Claim 5] The difference of the temperature which has the temperature setting section which sets up the target temperature of the vehicle interior of a room, and was detected by said 1st temperature sensor, and the temperature set up by said temperature setting section, Or the air-conditioning control unit for cars according to claim 1 considers that is in a temperature control transient when the difference of the temperature detected by said 2nd temperature sensor and the temperature set up by said temperature setting section is beyond a predetermined value, and consider that is at the time of a temperature control stationary when smaller than said predetermined value.

[Claim 6] If said up outlet and lower outlet are in an air-conditioning transient with said air-conditioning condition distinction means in the condition of being set as the opening which forms vent mode and it will be distinguished The temperature detected by said 1st temperature sensor is used as whenever [said vehicle room air temperature]. If said up outlet and lower outlet are in an air-conditioning transient with said air-conditioning condition distinction means in the condition of being set as the opening which forms foot mode and it will be distinguished The air-conditioning control unit for cars according to claim 1 using the temperature detected by said 2nd temperature sensor as whenever [said vehicle room air temperature].
[Claim 7] When set as the opening in which it has the temperature setting section which sets up the target temperature of the vehicle interior of a room, and said up outlet and lower outlet form Mohd other than vent mode or foot mode If it is in an air-conditioning transient with said air-conditioning condition distinction means and will be distinguished The temperature detected by said 2nd temperature sensor when the difference of the temperature detected by said 1st temperature sensor and said target temperature was smaller than the difference of the temperature detected by said 2nd temperature sensor and said target temperature is used as whenever [said vehicle room air temperature]. The air-conditioning control unit for cars according to claim 6 using the temperature detected by said 1st temperature sensor when large as whenever [said vehicle room air temperature].

[Translation done.]

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3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention inputs environmental information including whenever [vehicle room air temperature] into a control unit, and relates to the air-conditioning control unit for cars which controls air-conditioning equipment by the program given beforehand, and carries out temperature control control of the vehicle interior of a room.
[0002]
[Description of the Prior Art] As for the conventional air-conditioning control device for cars, what arranged the sensor in the dashboard whenever [room air temperature / which detects whenever / vehicle room air temperature] is common. For example, if it is in JP,1-269646,A, JP,57-14087,Y, etc. A sensor is formed in the inhalation-of-air path upstream of the aspirator formed in the dashboard whenever [room air temperature]. A room temperature is appropriately detected by making the air of the vehicle interior of a room attracted with an aspirator always flow around a sensor whenever [room air temperature], and the point of having used this detection result for air-conditioning control is indicated.
[0003] Moreover, the temperature of the upper part of a vehicle room and the lower part is detected, respectively, and it inputs into a control unit, and in JP,55-143345,A, a control unit changes weighting of up temperature and lower temperature according to blow-off Mohd according to the program decided beforehand, and compounds a representation room temperature to it, and the air-conditioning control unit for cars which was made to carry out temperature control control of the vehicle interior of a room by controlling air-conditioning equipment based on this synthetic value is indicated.
[0004]
[Problem(s) to be Solved by the Invention] While carrying out a deer With the configuration which installs one temperature sensor in a dashboard, even if dispersion is in the temperature distribution of the vehicle interior of a room, since whenever [vehicle room air temperature] will be represented with the temperature (crew's temperature of the abdomen circumference) of the dashboard neighborhood, if air-conditioning equipment is controlled by this temperature, it cannot be said that air-conditioning control which matched crew's thermal sensation not only at the transient in early stages of air-conditioning but at the time of a stationary can not necessarily be performed.,
[0005] For example, if considering the vent mode at the time of air conditioning (up blow off) it is in the transient in early stages of air conditioning, as the temperature of the circumference [of a vehicle room] of head (B location of drawing 1), abdomen circumference (A location of drawing 1 which shows near dashboard), and leg circumference (C location of drawing 1) is shown by drawing 5 , it changes. That is, the temperature around a head falls early most, subsequently, the temperature of the abdomen circumference falls early and the temperature of the leg circumference falls latest.
[0006] In order to investigate the correlation of the temperature in such a transient, and crew's thermal sensation The evaluation value about thermal sensation is measured from many test subjects, and it is Yi =(Xi-X'i)/sigmai about the value between test subjects according to blow-off Mohd in this. If it

normalizes and the correlation coefficient using the average estimates The temperature of correlation around a head is as the highest as crew's thermal sensation, if blow-off air is low-speed airflow, subsequently the leg circumference will become high and, as for the abdomen circumference, correlation will become low most, so that the correlation coefficient (LH, MH) by which the absolute value notation of drawing 6 was carried out may show. Moreover, if it is medium-speed airflow, correlation will become low in the order of a head, an abdomen, and the leg. Anyway, crew's thermal sensation has the temperature around a head, and the highest correlation. In addition, they are the average of an evaluation value [in / the value to which a test subject's i Xi normalized Yi, and Xi among the formula used for normalization, and / in X'i / a test subject's i monograph affair], and sigmai. The standard deviation of the evaluation value in a test subject's i monograph affair is shown, respectively. [a test subject's i evaluation value] Moreover, the correlation shown by drawing 6 shows the correlation according to blow-off mode which is unrelated to air conditioning and heating.

[0007] Similarly, if it is in the foot mode at the time of heating (lower blow off), as shown in drawing 5 , in early stages of heating, the temperature of the leg circumference goes up early most, the temperature of the abdomen circumference goes up early and, subsequently the temperature around a head goes up latest. Leg ambient temperature of correlation is the highest, subsequently the temperature around a head becomes high, and, as for the temperature of the abdomen circumference, correlation becomes low most so that the experimental result of drawing 6 may show the correlation with the thermal sensation of the crew in the transient in this case.

[0008] For this reason, when using the temperature (abdomen ambient temperature) of the dashboard neighborhood for control of an air-conditioning transient, things were those to which control which will control by temperature of the part where correlation with crew's thermal sensation is the lowest sometimes, and ignored crew's thermal sensation will be performed.

[0009] Control which switches blow-off Mohd to a bilevel mode and vent mode is performed as blow-off Mohd is made into foot mode and it becomes low, since the request of heating is so high that whenever [need blow-off temperature] is high if it is in the auto air-conditioner which whenever [for completing whenever / factor empty vehicle room air temperature /, such as vehicle outdoor temperature and target temperature, / as target temperature / need blow-off temperature] calculates whenever [vehicle room air temperature] (refer to drawing 7). For this reason, although it becomes vent mode in the air conditioning early stages of automatic air-conditioning control and usually becomes foot mode in early stages of heating, in drawing 5 , the temperature change of each part the case where blow-off Mohd is set as a bilevel mode, differential-gear foot mode, and foot mode in early stages of air conditioning, and in case blow-off Mohd is set as vent mode, a bilevel mode, and differential-gear foot mode in early stages of heating is also shown.

[0010] After all, when these are summarized, as the correlation in a transient is shown in drawing 8 , it turns out that air conditioning and heating are not asked, but crew's thermal sensation and correlation become [head ambient temperature] the highest in vent mode, and crew's thermal sensation and correlation become [leg ambient temperature] the highest in foot mode. In addition, although the vent mode in the transient of drawing 8 is made to correspond to LH of drawing 6 , there is no change in it becoming high [crew's thermal sensation and correlation] most [head ambient temperature] only by the sequence of correlation of A and C interchanging in the case of MH. Moreover, although the foot mode of a transient is made equivalent to LL, even if expressed with ML, there is no change in mutually related sequence.

[0011] Moreover, if the time of air conditioning is taken for an example even if it is, when time amount has passed enough, after air-conditioning is started, as shown in drawing 9 (a) As shown by Rhine A with the conventional air conditioner with which a temperature sensor is installed in a dashboard, the detection temperature of a temperature sensor is the target temperature Tset. Although controlled to converge The leg will become past [the cold] if the temperature of a head will become lower than target temperature if blow-off Mohd is vent mode, and it has become foot mode.

[0012] if similarly the temperature of a head will become higher than target temperature if blow-off Mohd is vent mode and it has become foot mode as shown in drawing 9 (b) even if it is at the time of heating, the leg is a little tepid -- past -- it becomes.

[0013] Thus, when it controls by temperature sensor A of a dashboard, even if it is at the time of a stationary, it is shown that the displeasure resulting from the temperature of a head or the leg separating from target temperature exists.

[0014] On the other hand, although it is the point of having detected the temperature of the vehicle room upper part and the lower part and the difference of ****** of whenever [vehicle room temperature] is taken into consideration if it is in the latter conventional technique weighting is changed by up blow off and lower blow off, a composite signal is formed, and it becomes the configuration which controls an air conditioner based on this -- **** -- it cannot be said that it does not pass but temperature control control which matched crew's thermal sensation can not necessarily be performed [at both the air-conditioning transient mentioned above and the time of a stationary].

[0015] Namely, although it is thought in a transient that changing weighting for every blow-off Mohd, and determining whenever [room air temperature] can respond to an above-mentioned conclusion (thermal sensation and correlation have high up temperature in vent mode, and thermal sensation and correlation have high lower temperature in foot mode) If it is at the time of a stationary, as shown in drawing 8 , it is checked that correlation with the temperature around a head and crew's thermal sensation becomes the highest regardless of blow-off Mohd. That is, if it is at the time of a stationary, temperature control sensed that crew is comfortable sure enough can be realized by changing weighting for every blow-off Mohd, and determining whenever [room air temperature], or a question remains.

[0016] Then, in this invention, also in the air-conditioning transient, since a different new way from the detection gestalt of whenever [conventional vehicle room air temperature] is needed in order to perform temperature control control which crew senses is comfortable at the time of a stationary, information is appropriately collected whenever [room air temperature] in a transient and the time of a stationary, and it is making into the technical problem to offer the air-conditioning control unit for cars which can give crew more comfortable thermal sensation.

[0017]

[Means for Solving the Problem] This invention person, like ****, it sets to an air-conditioning transient. If it is in vent mode, regardless of an air conditioning, correlation with head ambient temperature and crew's thermal sensation is high. If it is in foot mode, regardless of an air conditioning, correlation with leg ambient temperature and thermal sensation will become high. Moreover, it sets at the time of an air-conditioning stationary (condition that the difference of head ambient temperature and leg ambient temperature, the difference of head ambient temperature and target temperature, or the difference of leg ambient temperature and target temperature becomes small). Based on the knowledge that correlation with head ambient temperature and thermal sensation becomes high, it came to complete this invention irrespective of blow-off Mohd. Moreover, in the bilevel mode, this invention person came to build this invention also from the knowledge that correlation with leg ambient temperature and thermal sensation becomes high, when the difference of head ambient temperature and target temperature is smaller than the difference of leg ambient temperature and target temperature.

[0018] namely, The air-conditioning control unit for cars concerning this invention It has the lower outlet which blows off air on crew's lower half of the body, and the up outlet which blows off air in crew's upper half of the body. Input environmental information including whenever [vehicle room air temperature] into a control unit, and blow-off air temperature is adjusted according to said environmental information by the program given beforehand. The 1st temperature sensor which is applied to what supplies temperature control air to a vehicle room from said selected outlet, and detects the air temperature of the vehicle room upper part, and the 2nd temperature sensor which detects the air temperature of the vehicle room lower part, An air-conditioning condition distinction means to distinguish whether it is in the conditions regarded as the vehicle interior of a room being in an air-conditioning transient, or it is in the conditions consider that are at the time of an air-conditioning stationary, When it was in said air-conditioning transient with said distinction means and is distinguished, the inside of said 1st and 2nd temperature sensors, The temperature at which correlation with crew's thermal sensation was detected by the temperature sensor of a high side is used as whenever

[said vehicle room air temperature]. When it is distinguished by said distinction means that it is at said air-conditioning stationary time, it is characterized by having a temperature information change means using the temperature detected by said 1st temperature sensor as whenever [said vehicle room air temperature] (claim 1).

[0019] The control approach realized by such control unit The process which distinguishes whether it is in the conditions regarded as the vehicle interior of a room being in an air-conditioning transient, or it is in the conditions consider that are at the time of an air-conditioning stationary, The process using the temperature at which correlation with crew's thermal sensation was detected by the temperature sensor of a high side among said 1st and 2nd temperature sensors when it was in said air-conditioning transient according to said distinction process and was distinguished as whenever [said vehicle room air temperature], When it is distinguished by said distinction process that it is at said air-conditioning stationary time, it is a thing including the process using the temperature detected by said 1st temperature sensor as whenever [said vehicle room air temperature]. It is made to distinguish whether it is in the conditions regarded as the vehicle interior of a room being in an air-conditioning transient in fact, or it is in the conditions consider that are at the time of an air-conditioning stationary. When it was in the air-conditioning transient and is distinguished, the temperature at which correlation with crew's thermal sensation was detected by the temperature sensor of a high side among said 1st and 2nd temperature sensors is inputted. When it is distinguished that it is at the air-conditioning stationary time, it realizes by equipping a computer with the medium by which the program which inputs the temperature detected by said 1st temperature sensor as whenever [vehicle room air temperature] was memorized.

[0020] Therefore, in an air-conditioning transient, the temperature signal by which correlation with crew's thermal sensation was detected by the temperature sensor of a high side among the 1st and 2nd temperature sensors is inputted into a control unit, blow-off air temperature is adjusted by the program to which it was given beforehand, and the outlet empty vehicle room where this air by which temperature control was carried out was chosen is supplied.

[0021] It is considered that an air-conditioning condition distinction means is in a temperature control transient when the difference of each temperature detected by the 1st temperature sensor and 2nd temperature sensor is beyond a predetermined value. When smaller than said predetermined value, even if it makes it consider that it is at the time of an air-conditioning stationary (claim 2) It is considered that it is in an air-conditioning transient when the rate of change of the temperature detected by the 1st temperature sensor or 2nd temperature sensor is beyond a predetermined value. When smaller than said predetermined value, even if it makes it consider that it is at the time of an air-conditioning stationary (claim 3), it considers that between after temperature control is started until it carries out predetermined time progress is in an air-conditioning transient, and you may make it consider that said predetermined time progress back is at the time of an air-conditioning stationary (claim 4).

[0022] Furthermore, the difference of the temperature which has the temperature setting section which sets up the target temperature of the vehicle interior of a room, and was detected by said 1st temperature sensor, and the temperature set up by said temperature setting section, Or when the difference of the temperature detected by said 2nd temperature sensor and the temperature set up by said temperature setting section is beyond a predetermined value, it considers that it is in a temperature control transient, and when smaller than said predetermined value, you may make it consider that it is at the time of a temperature control stationary (claim 5).

[0023] An infrared sensor, IC temperature sensor, a temperature-sensitive ferrite, etc. may be used for a temperature sensor that the temperature of the upper part of the vehicle interior of a room or the lower part just detects substantially, using the usual thermistor.

[0024] correlation with crew's thermal sensation the temperature detected by the temperature sensor of a high side as using as whenever [said vehicle room air temperature] among said 1st and 2nd temperature sensors If an up outlet and a lower outlet are in an air-conditioning transient with said air-conditioning condition distinction means in the condition of being set as the opening which forms vent mode and it will be distinguished The temperature detected by said 1st temperature sensor is used as whenever [said vehicle room air temperature]. If said up outlet and lower outlet are in an air-conditioning transient with said air-conditioning condition distinction means in the condition of being set as the opening which forms foot mode and it will be distinguished It is using the temperature detected by said 2nd temperature sensor as whenever [said vehicle room air temperature] (claim 6). Furthermore, if it is in an air-conditioning transient with said air-conditioning condition distinction means and will be distinguished when the up outlet and the lower outlet are set as the opening which forms Mohd other than vent mode or foot mode The temperature detected by said 2nd temperature sensor when the difference of the temperature detected by said 1st temperature sensor and said target temperature was smaller than the difference of the temperature detected by said 2nd temperature sensor and said target temperature is used as whenever [said vehicle room air temperature]. When large, it says using the temperature detected by said 1st temperature sensor as whenever [said vehicle room air temperature] (claim 7).

[0025] Therefore, if it is in vent mode, it is not concerned with heating and cooling and heating, but the output of the 1st temperature sensor with the high correlation with crew's thermal sensation is used, and even if it shifts after that at the time of a stationary, the output of the 1st temperature sensor will be used for an air-conditioning transient. On the other hand, if it is in foot mode, and it is not concerned with heating and cooling and heating, but the output of the 2nd temperature sensor with the high correlation with crew's thermal sensation is used and it shifts after that at the time of a stationary, the output of the 1st mutually related high temperature sensor will be used for an air-conditioning transient.

[0026] Moreover, if air-conditioning transients are Mohd other than vent mode or foot mode Since crew's thermal sensation and correlation become [the output of the 2nd temperature sensor] high when the difference of the temperature and target temperature which were detected by the 1st temperature sensor is smaller than the difference of the temperature and target temperature which were detected by the 2nd temperature sensor, this output is used. In being conversely large Since crew's thermal sensation and correlation become [the output of the 1st temperature sensor] high, this output is used. And if it shifts at the time of a stationary, the output of the 1st mutually related high temperature sensor will be used.

[0027]

[Embodiment of the Invention] Hereafter, a drawing explains the gestalt of implementation of this invention. In drawing 1 , the air-conditioning control device for cars assumes what is arranged inside the dashboard 1 of a car, the intake transfer device 5 which has the bashful inlet 3 and the open air inlet 4 in the maximum upstream of the air-conditioning case 2 is formed, and an introductory rate with the open air is adjusted by the intake door 6 as it is bashful. It is prepared so that the blower 8 which rotates by the motor 7 may attend said inlet, and by rotation of a blower 8, into the air-conditioning duct 2, air is attracted from an inlet, and it feeds to the downstream into it.

[0028] An evaporator 9 is allotted, and in the downstream of a blower 8, piping association is carried out with the compressor which is not illustrated, a capacitor, a liquid tank, an expansion valve, etc., and this evaporator 9 constitutes the air conditioning cycle, and cools to it the air which supplies a refrigerant to an evaporator 9 by operation of a compressor, and passes this evaporator 9.

[0029] The heater core 10 which makes an engine cooling water a heat source is arranged at the downstream of an evaporator 9, and the air mix door 11 is allotted before this heater core 10. The rate of the air to which the air which passed the evaporator 9 passes the heater core 10 by this air mix door 11, and the air which bypasses this is adjusted.

[0030] And air in which temperature control was carried out by the evaporator 9 and the heater core 10, It is ventilated at the outlet (differential-gear outlet 13a, vent outlet 13b, foot outlet 13c) empty vehicle room 14 opened and closed by the mode doors 12a and 12b prepared in the lowest style side of the air-conditioning duct 2. Here, it is open for free passage, respectively to lower outlet 17b by which foot outlet 13c which supplies air supplies air to a step to crew's step at up outlet 17a by which vent outlet 13b which supplies air to crew's upper half of the body supplies air to crew's upper half of the body.

[0031] Drive control of each air-conditioning equipment mentioned above is carried out by the control signal from a control unit 15, and this control unit 15 is equipped with the microcomputer equipped with CPU, ROM, RAM, etc., the input/output port of a signal, etc., changes various input signals into a control signal based on the predetermined program given beforehand, and controls each air-conditioning

equipment.
[0032] Namely, up temperature sensor B which detects the temperature (Tr1) of the vehicle room upper part, lower temperature sensor C which detects the temperature (Tr2) of the vehicle room lower part, The signal of the temperature setter 16 grade which sets up the OAT sensor D which detects outside air temperature (Ta), and the target temperature (Tset) of the vehicle interior of a room is inputted into a control unit 15. Based on the various signals inputted here, To is calculated whenever [need blow-off temperature], and drive control of the various doors 6, 11, 12a, and 12b or the blower 8 grade is carried out so that it may be completed as target temperature (Tset) by whenever [vehicle room air temperature]. What is necessary is here, to arrange up temperature sensor B in the location near the head of crews, such as head lining, and just to arrange lower temperature sensor C near the foot outlet 13c of a dash panel lower part.
[0033] A process until it calculates whenever [of operation example / which controls each air-conditioning equipment by the control unit 15 to drawing 2 /, especially target blow-off temperature] is shown as a flow chart, and a control unit 15 goes into this manipulation routine after operation of an air conditioner, and inputs various information, such as vehicle room up temperature (Tr1), lower temperature (Tr2), outside air temperature (Ta), and target temperature (Tset), (step 50).
[0034] Although these various input will be used by each auto control of an auto air-conditioner At the process which calculates whenever [target blow-off temperature], while calculating the difference (|Tr1-Tset |) of up temperature and target temperature, and the difference (|Tr2-Tset |) of lower temperature and target temperature, the difference (|Tr1-Tr2|) of up temperature and lower temperature is calculated (steps 52 and 54).
[0035] When the difference (|Tr1-Tset |) of up temperature and target temperature or the difference (|Tr2-Tset |) of lower temperature and target temperature is large From the ability to be said that whenever [vehicle room air temperature] is the transient in early stages of air-conditioning which is not fully converged on target temperature Bordering on the predetermined value alpha, when said difference is larger than this, it distinguishes from a transient, and with alpha [below], it distinguishes further whether it is an air-conditioning transient or it is at the stationary time according to the difference (|Tr1-Tr2|) of up temperature and lower temperature (step 56).
[0036] Since it can say that it is at the air-conditioning stationary time which whenever [vehicle room air temperature] converged on target temperature when the difference of up temperature and lower temperature is small, if it considers that it would be in the steady state bordering on the predetermined value beta when |Tr1-Tr2| was less than [this], and larger [than beta] and it is still in a transient, it will distinguish (step 58).
[0037] When judged with current blow-off Mohd judging vent mode, foot mode, and other Mohd (bilevel mode etc.) (steps 60 and 62), and it being in vent mode, when distinguished from a transient, since crew's thermal sensation and correlation become high, the temperature around a head considers as whenever [vehicle room air temperature] with the temperature (Tr1) from up temperature sensor B, and performs future air-conditioning control. That is, To is calculated as To=f (Tr1, Ta, Tset, ...) whenever [need blow-off temperature], and Tr1 is the target temperature Tset. Drive control of the various doors 6, 11, 12a, and 12b or the blower 8 grade is carried out so that it may converge (step 64).
[0038] On the other hand, when judged with it being in foot mode by the transient, since crew's thermal sensation and correlation become high, the temperature of the leg circumference considers as whenever [vehicle room air temperature] with the temperature (Tr2) from lower temperature sensor C, and performs future air-conditioning control. That is, To is calculated as To=f (Tr2, Ta, Tset, ...) whenever [need blow-off temperature], and Tr2 is the target temperature Tset. Drive control of the various doors 6, 11, 12a, and 12b or the blower 8 grade is carried out so that it may converge (step 66).
[0039] Moreover, when judged with blow-off Mohd's being Mohd other than vent modes and foot modes, such as a bilevel mode, it is processed as follows. First, if it is in the transient of a bilevel mode If the difference (|Tr1-Tset |) of up temperature and target temperature is smaller than the difference (|Tr2-Tset |) of lower temperature and target temperature, correlation with lower temperature and crew's thermal sensation will become high, and if reverse If judged with it progressing to step 68 and being

|Tr1-Tset |<|Tr2-Tset |, since it turns out that correlation with up temperature and crew's thermal sensation becomes high It considers as whenever [vehicle room air temperature] with the temperature (Tr2) from lower temperature sensor C, and if reverse, it will consider as whenever [vehicle room air temperature] with the temperature (Tr1) from up temperature sensor B.

[0040] Thereby, in a transient, since temperature control of the vehicle room is carried out by crew's thermal sensation and the temperature of a mutually related high part and it converges the temperature of the part toward target temperature according to blow-off Mohd with them, comfortable thermal sensation can be given to crew.

[0041] Air-conditioning progresses and it is completed as target temperature by the output of the temperature sensor chosen by each blow-off Mohd, and if it becomes at the time of the stationary which |Tr1-Tr2| becomes below beta at step 58, blow-off Mohd will change to a bilevel mode (step 70), and future control will be performed by relation with the up temperature to which correlation becomes high most with crew's thermal sensation at the time of a stationary. That is, To is calculated as To=f (Tr1, Ta, Tset, ...) whenever [need blow-off temperature], and Tr1 is the target temperature Tset. Drive control of the various doors 6, 11, 12a, and 12b or the blower 8 grade is carried out so that convergence may be maintained.

[0042] In the above-mentioned configuration, although it will become a bilevel mode if it results at the time of a stationary when set as vent mode by the transient, in this case, it is not concerned at a transient and the time of a stationary, but up temperature Tr1 is considered as whenever [vehicle room air temperature], and air-conditioning control is carried out. Moreover, the temperature sensor used while blow-off Mohd will change to a bilevel mode, if it becomes at the time of a stationary, although lower temperature Tr2 will be considered as whenever [vehicle room air temperature] in this transient and air-conditioning control will be carried out if set as foot mode by the transient also changes to up temperature sensor B, up temperature Tr1 is considered as whenever [vehicle room air temperature], and air-conditioning control is carried out.

[0043] And although there will be no switch of blow-off Mohd at this transient when the temperature of a side with the high correlation with crew's thermal sensation is used for air-conditioning control as whenever [vehicle room air temperature] and shifts at the time of a stationary if a transient is a bilevel mode, air-conditioning control will be carried out by only the up temperature Tr1.

[0044] Therefore, since air-conditioning control is performed referring to not only a transient but the temperature of the part to which correlation becomes high most with crew's thermal sensation at the time of a stationary, always spoiling crew's thermal sensation is lost.

[0045] Moreover, although modification actuation of target temperature etc. will be performed and it will get if crew's thermal sensation changes by switching blow-off Mohd since it is set as a bilevel mode no matter the transient may be set up by what blow-off Mohd at the time of a stationary In the above-mentioned configuration, since crew's thermal sensation is not spoiled by switching a temperature sensor appropriately, modification actuation of target temperature etc. becomes unnecessary and the troublesomeness which controls crew's air conditioner can be reduced.

[0046] In addition, although it was made to perform distinction of a transient and the time of a stationary using the factor of temperature, you may make it distinguish with the factor of only temperature, time amount, or time amount in the above-mentioned example of a configuration. As shown in drawing 3 , it replaces with said step 54. For example, the rate of change of up temperature, Or the rate of change of lower temperature is calculated (step 72), and when this rate of change is large, the vehicle interior of a room is in the early condition converged on target temperature. Since it can conclude that it is in the condition converged mostly when small, you may make it make the judgment of said step 58 substitute for the judgment which considers that the case where said rate of change is larger than the predetermined value gamma is a transient, and considers that the case of being small is a steady state (step 74).

[0047] Or a timer is started and the time check from the time of operation of an air conditioner is performed (step 76), and since it should be completed as target temperature by the vehicle interior of a room so that the time amount from the time of operation is long, you may make it make the judgment of said step 58 substitute for the judgment which it borders a timer on predetermined time delta, considers that the case of being shorter is a transient, and considers that the case of being long is a steady state, as shown by drawing 4 (step 78).

[0048] Although it cannot be overemphasized that the same operation effectiveness as the control which makes only temperature a factor is acquired even if it is in these control gestalten, it is desirable to assign the time amount delta on which in the control which makes only time amount a factor it decided in the experiment etc. beforehand according to vehicle indoor initial temperature, blow-off Mohd, etc. since the suitable switching time from a transient to a steady state changed with vehicle indoor initial temperature, blow-off Mohd, etc.

[0049]

[Effect of the Invention] As stated above, according to this invention, to an air-conditioning transient The inside of the 1st and 2nd temperature sensors, Since the temperature signal detected by the 1st temperature sensor is used for air-conditioning control when it is distinguished that the temperature signal by which correlation with crew's thermal sensation was detected by the temperature sensor of a high side is used for air-conditioning control, and is at the air-conditioning stationary time Also at the time of a transient and a stationary, temperature control of the vehicle interior of a room will be carried out by the temperature signal with high crew's thermal sensation and correlation, and information can be collected whenever [room air temperature] always appropriately, and it can give crew comfortable thermal sensation rather than before.

[0050] Moreover, since it can respond with two temperature sensors, the 1st and the 2nd, at an air-conditioning transient and the time of a stationary, if it is the conventional hard configuration with which the temperature sensor is formed in the vehicle room upper part and the lower part, since the program of a control unit could be responded only by modification ****** and it has at least one temperature sensor by the usual auto air-conditioner, what is necessary is just to add one, even if it adds a temperature sensor, and improvement in a comfortable feeling can be aimed at at low cost.

[0051] moreover -- since the temperature sensor of a side with the high correlation with crew's thermal sensation is chosen automatically and used -- specially -- the time of the shift from an air-conditioning transient to the time of a stationary -- or it decreases that as actual whenever it switches blow-off Mohd temperature control as crew's feeling shifts, and it is obliged to setting modification by the hand control of an air conditioner. Consequently, suitable temperature control control corresponding to a thermal load can be realized, and energy saving can be realized.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention] This invention inputs environmental information including whenever [vehicle room air temperature] into a control unit, and relates to the air-conditioning control unit for cars which controls air-conditioning equipment by the program given beforehand, and carries out temperature control control of the vehicle interior of a room.

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EFFECT OF THE INVENTION

[Effect of the Invention] As stated above, according to this invention, to an air-conditioning transient The inside of the 1st and 2nd temperature sensors, Since the temperature signal detected by the 1st temperature sensor is used for air-conditioning control when it is distinguished that the temperature signal by which correlation with crew's thermal sensation was detected by the temperature sensor of a high side is used for air-conditioning control, and is at the air-conditioning stationary time Also at the time of a transient and a stationary, temperature control of the vehicle interior of a room will be carried out by the temperature signal with high crew's thermal sensation and correlation, and information can be collected whenever [room air temperature] always appropriately, and it can give crew comfortable thermal sensation rather than before.
[0050] Moreover, since it can respond with two temperature sensors, the 1st and the 2nd, at an air-conditioning transient and the time of a stationary, if it is the conventional hard configuration with which the temperature sensor is formed in the vehicle room upper part and the lower part, since the program of a control unit could be responded only by modification ****** and it has at least one temperature sensor by the usual auto air-conditioner, what is necessary is just to add one, even if it adds a temperature sensor, and improvement in a comfortable feeling can be aimed at at low cost.
[0051] moreover -- since the temperature sensor of a side with the high correlation with crew's thermal sensation is chosen automatically and used -- specially -- the time of the shift from an air-conditioning transient to the time of a stationary -- or it decreases that as actual whenever it switches blow-off Mohd temperature control as crew's feeling shifts, and it is obliged to setting modification by the hand control of an air conditioner. Consequently, suitable temperature control control corresponding to a thermal load can be realized, and energy saving can be realized.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] While carrying out a deer With the configuration which installs one temperature sensor in a dashboard, even if dispersion is in the temperature distribution of the vehicle interior of a room, since whenever [vehicle room air temperature] will be represented with the temperature (crew's temperature of the abdomen circumference) of the dashboard neighborhood, if air-conditioning equipment is controlled by this temperature, it cannot be said that air-conditioning control which matched crew's thermal sensation not only at the transient in early stages of air-conditioning but at the time of a stationary can not necessarily be performed.,
[0005] For example, if considering the vent mode at the time of air conditioning (up blow off) it is in the transient in early stages of air conditioning, as the temperature of the circumference [of a vehicle room] of head (B location of drawing 1), abdomen circumference (A location of drawing 1 which shows near dashboard), and leg circumference (C location of drawing 1) is shown by drawing 5 , it changes. That is, the temperature around a head falls early most, subsequently, the temperature of the abdomen circumference falls early and the temperature of the leg circumference falls latest.
[0006] In order to investigate the correlation of the temperature in such a transient, and crew's thermal sensation The evaluation value about thermal sensation is measured from many test subjects, and it is Yi =(Xi-X'i)/sigmai about the value between test subjects according to blow-off Mohd in this. If it normalizes and the correlation coefficient using the average estimates The temperature of correlation around a head is as the highest as crew's thermal sensation, if blow-off air is low-speed airflow, subsequently the leg circumference will become high and, as for the abdomen circumference, correlation will become low most, so that the correlation coefficient (LH, MH) by which the absolute value notation of drawing 6 was carried out may show. Moreover, if it is medium-speed airflow, correlation will become low in the order of a head, an abdomen, and the leg. Anyway, crew's thermal sensation has the temperature around a head, and the highest correlation. In addition, they are the average of an evaluation value [in / the value to which a test subject's i Xi normalized Yi, and Xi among the formula used for normalization, and / in X'i / a test subject's i monograph affair], and sigmai. The standard deviation of the evaluation value in a test subject's i monograph affair is shown, respectively. [a test subject's i evaluation value] Moreover, the correlation shown by drawing 6 shows the correlation according to blow-off mode which is unrelated to air conditioning and heating.
[0007] Similarly, if it is in the foot mode at the time of heating (lower blow off), as shown in drawing 5 , in early stages of heating, the temperature of the leg circumference goes up early most, the temperature of the abdomen circumference goes up early and, subsequently the temperature around a head goes up latest. Leg ambient temperature of correlation is the highest, subsequently the temperature around a head becomes high, and, as for the temperature of the abdomen circumference, correlation becomes low most so that the experimental result of drawing 6 may show the correlation with the thermal sensation of the crew in the transient in this case.
[0008] For this reason, when using the temperature (abdomen ambient temperature) of the dashboard neighborhood for control of an air-conditioning transient, things were those to which control which will control by temperature of the part where correlation with crew's thermal sensation is the lowest

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PRIOR ART

[Description of the Prior Art] As for the conventional air-conditioning control device for cars, what arranged the sensor in the dashboard whenever [room air temperature / which detects whenever / vehicle room air temperature] is common. For example, if it is in JP,1-269646,A, JP,57-14087,Y, etc. A sensor is formed in the inhalation-of-air path upstream of the aspirator formed in the dashboard whenever [room air temperature]. A room temperature is appropriately detected by making the air of the vehicle interior of a room attracted with an aspirator always flow around a sensor whenever [room air temperature], and the point of having used this detection result for air-conditioning control is indicated.
[0003] Moreover, the temperature of the upper part of a vehicle room and the lower part is detected, respectively, and it inputs into a control unit, and in JP,55-143345,A, a control unit changes weighting of up temperature and lower temperature according to blow-off Mohd according to the program decided beforehand, and compounds a representation room temperature to it, and the air-conditioning control unit for cars which was made to carry out temperature control control of the vehicle interior of a room by controlling air-conditioning equipment based on this synthetic value is indicated.

[Translation done.]

sometimes, and ignored crew's thermal sensation will be performed.

[0009] Control which switches blow-off Mohd to a bilevel mode and vent mode is performed as blow-off Mohd is made into foot mode and it becomes low, since the request of heating is so high that whenever [need blow-off temperature] is high if it is in the auto air-conditioner which whenever [for completing whenever / factor empty vehicle room air temperature /, such as vehicle outdoor temperature and target temperature, / as target temperature / need blow-off temperature] calculates whenever [vehicle room air temperature] (refer to drawing 7). For this reason, although it becomes vent mode in the air conditioning early stages of automatic air-conditioning control and usually becomes foot mode in early stages of heating, in drawing 5 , the temperature change of each part the case where blow-off Mohd is set as a bilevel mode, differential-gear foot mode, and foot mode in early stages of air conditioning, and in case blow-off Mohd is set as vent mode, a bilevel mode, and differential-gear foot mode in early stages of heating is also shown.

[0010] After all, when these are summarized, as the correlation in a transient is shown in drawing 8 , it turns out that air conditioning and heating are not asked, but crew's thermal sensation and correlation become [head ambient temperature] the highest in vent mode, and crew's thermal sensation and correlation become [leg ambient temperature] the highest in foot mode. In addition, although the vent mode in the transient of drawing 8 is made to correspond to LH of drawing 6 , there is no change in it becoming high [crew's thermal sensation and correlation] most [head ambient temperature] only by the sequence of correlation of A and C interchanging in the case of MH. Moreover, although the foot mode of a transient is made equivalent to LL, even if expressed with ML, there is no change in mutually related sequence.

[0011] Moreover, if the time of air conditioning is taken for an example even if it is, when time amount has passed enough, after air-conditioning is started, as shown in drawing 9 (a) As shown by Rhine A with the conventional air conditioner with which a temperature sensor is installed in a dashboard, the detection temperature of a temperature sensor is the target temperature Tset. Although controlled to converge The leg will become past [the cold] if the temperature of a head will become lower than target temperature if blow-off Mohd is vent mode, and it has become foot mode.

[0012] if similarly the temperature of a head will become higher than target temperature if blow-off Mohd is vent mode and it has become foot mode as shown in drawing 9 (b) even if it is at the time of heating, the leg is a little tepid -- past -- it becomes.

[0013] Thus, when it controls by temperature sensor A of a dashboard, even if it is at the time of a stationary, it is shown that the displeasure resulting from the temperature of a head or the leg separating from target temperature exists.

[0014] On the other hand, although it is the point of having detected the temperature of the vehicle room upper part and the lower part and the difference of ****** of whenever [vehicle room temperature] is taken into consideration if it is in the latter conventional technique weighting is changed by up blow off and lower blow off, a composite signal is formed, and it becomes the configuration which controls an air conditioner based on this -- **** -- it cannot be said that it does not pass but temperature control control which matched crew's thermal sensation can not necessarily be performed [at both the air-conditioning transient mentioned above and the time of a stationary].

[0015] Namely, although it is thought in a transient that changing weighting for every blow-off Mohd, and determining whenever [room air temperature] can respond to an above-mentioned conclusion (thermal sensation and correlation have high up temperature in vent mode, and thermal sensation and correlation have high lower temperature in foot mode) If it is at the time of a stationary, as shown in drawing 8 , it is checked that correlation with the temperature around a head and crew's thermal sensation becomes the highest regardless of blow-off Mohd. That is, if it is at the time of a stationary, temperature control sensed that crew is comfortable sure enough can be realized by changing weighting for every blow-off Mohd, and determining whenever [room air temperature], or a question remains.

[0016] Then, in this invention, also in the air-conditioning transient, since a different new way from the detection gestalt of whenever [conventional vehicle room air temperature] is needed in order to perform temperature control control which crew senses is comfortable at the time of a stationary, information is appropriately collected whenever [room air temperature] in a transient and the time of a stationary, and it is making into the technical problem to offer the air-conditioning control unit for cars which can give crew more comfortable thermal sensation.

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MEANS

[Means for Solving the Problem] This invention person, like ****, it sets to an air-conditioning transient. If it is in vent mode, regardless of an air conditioning, correlation with head ambient temperature and crew's thermal sensation is high. If it is in foot mode, regardless of an air conditioning, correlation with leg ambient temperature and thermal sensation will become high. Moreover, it sets at the time of an air-conditioning stationary (condition that the difference of head ambient temperature and leg ambient temperature, the difference of head ambient temperature and target temperature, or the difference of leg ambient temperature and target temperature becomes small). Based on the knowledge that correlation with head ambient temperature and thermal sensation becomes high, it came to complete this invention irrespective of blow-off Mohd. Moreover, in the bilevel mode, this invention person came to build this invention also from the knowledge that correlation with leg ambient temperature and thermal sensation becomes high, when the difference of head ambient temperature and target temperature is smaller than the difference of leg ambient temperature and target temperature.
[0018] namely, The air-conditioning control unit for cars concerning this invention It has the lower outlet which blows off air on crew's lower half of the body, and the up outlet which blows off air in crew's upper half of the body. Input environmental information including whenever [vehicle room air temperature] into a control unit, and blow-off air temperature is adjusted according to said environmental information by the program given beforehand. The 1st temperature sensor which is applied to what supplies temperature control air to a vehicle room from said selected outlet, and detects the air temperature of the vehicle room upper part, and the 2nd temperature sensor which detects the air temperature of the vehicle room lower part, An air-conditioning condition distinction means to distinguish whether it is in the conditions regarded as the vehicle interior of a room being in an air-conditioning transient, or it is in the conditions consider that are at the time of an air-conditioning stationary, When it was in said air-conditioning transient with said distinction means and is distinguished, the inside of said 1st and 2nd temperature sensors, The temperature at which correlation with crew's thermal sensation was detected by the temperature sensor of a high side is used as whenever [said vehicle room air temperature]. When it is distinguished by said distinction means that it is at said air-conditioning stationary time, it is characterized by having a temperature information change means using the temperature detected by said 1st temperature sensor as whenever [said vehicle room air temperature] (claim 1).
[0019] The control approach realized by such control unit The process which distinguishes whether it is in the conditions regarded as the vehicle interior of a room being in an air-conditioning transient, or it is in the conditions consider that are at the time of an air-conditioning stationary, The process using the temperature at which correlation with crew's thermal sensation was detected by the temperature sensor of a high side among said 1st and 2nd temperature sensors when it was in said air-conditioning transient according to said distinction process and was distinguished as whenever [said vehicle room air temperature], When it is distinguished by said distinction process that it is at said air-conditioning stationary time, it is a thing including the process using the temperature detected by said 1st temperature sensor as whenever [said vehicle room air temperature]. It is made to distinguish whether it is in the

conditions regarded as the vehicle interior of a room being in an air-conditioning transient in fact, or it is in the conditions consider that are at the time of an air-conditioning stationary. When it was in the air-conditioning transient and is distinguished, the temperature at which correlation with crew's thermal sensation was detected by the temperature sensor of a high side among said 1st and 2nd temperature sensors is inputted. When it is distinguished that it is at the air-conditioning stationary time, it realizes by equipping a computer with the medium by which the program which inputs the temperature detected by said 1st temperature sensor as whenever [vehicle room air temperature] was memorized.

[0020] Therefore, in an air-conditioning transient, the temperature signal by which correlation with crew's thermal sensation was detected by the temperature sensor of a high side among the 1st and 2nd temperature sensors is inputted into a control unit, blow-off air temperature is adjusted by the program to which it was given beforehand, and the outlet empty vehicle room where this air by which temperature control was carried out was chosen is supplied.

[0021] It is considered that an air-conditioning condition distinction means is in a temperature control transient when the difference of each temperature detected by the 1st temperature sensor and 2nd temperature sensor is beyond a predetermined value. When smaller than said predetermined value, even if it makes it consider that it is at the time of an air-conditioning stationary (claim 2) It is considered that it is in an air-conditioning transient when the rate of change of the temperature detected by the 1st temperature sensor or 2nd temperature sensor is beyond a predetermined value. When smaller than said predetermined value, even if it makes it consider that it is at the time of an air-conditioning stationary (claim 3), it considers that between after temperature control is started until it carries out predetermined time progress is in an air-conditioning transient, and you may make it consider that said predetermined time progress back is at the time of an air-conditioning stationary (claim 4).

[0022] Furthermore, the difference of the temperature which has the temperature setting section which sets up the target temperature of the vehicle interior of a room, and was detected by said 1st temperature sensor, and the temperature set up by said temperature setting section, Or when the difference of the temperature detected by said 2nd temperature sensor and the temperature set up by said temperature setting section is beyond a predetermined value, it considers that it is in a temperature control transient, and when smaller than said predetermined value, you may make it consider that it is at the time of a temperature control stationary (claim 5).

[0023] An infrared sensor, IC temperature sensor, a temperature-sensitive ferrite, etc. may be used for a temperature sensor that the temperature of the upper part of the vehicle interior of a room or the lower part just detects substantially, using the usual thermistor.

[0024] correlation with crew's thermal sensation the temperature detected by the temperature sensor of a high side as using as whenever [said vehicle room air temperature] among said 1st and 2nd temperature sensors If an up outlet and a lower outlet are in an air-conditioning transient with said air-conditioning condition distinction means in the condition of being set as the opening which forms vent mode and it will be distinguished The temperature detected by said 1st temperature sensor is used as whenever [said vehicle room air temperature]. If said up outlet and lower outlet are in an air-conditioning transient with said air-conditioning condition distinction means in the condition of being set as the opening which forms foot mode and it will be distinguished It is using the temperature detected by said 2nd temperature sensor as whenever [said vehicle room air temperature] (claim 6). Furthermore, if it is in an air-conditioning transient with said air-conditioning condition distinction means and will be distinguished when the up outlet and the lower outlet are set as the opening which forms Mohd other than vent mode or foot mode The temperature detected by said 2nd temperature sensor when the difference of the temperature detected by said 1st temperature sensor and said target temperature was smaller than the difference of the temperature detected by said 2nd temperature sensor and said target temperature is used as whenever [said vehicle room air temperature]. When large, it says using the temperature detected by said 1st temperature sensor as whenever [said vehicle room air temperature] (claim 7).

[0025] Therefore, if it is in vent mode, it is not concerned with heating and cooling and heating, but the output of the 1st temperature sensor with the high correlation with crew's thermal sensation is used, and even if it shifts after that at the time of a stationary, the output of the 1st temperature sensor will be used for an air-conditioning transient. On the other hand, if it is in foot mode, and it is not concerned with heating and cooling and heating, but the output of the 2nd temperature sensor with the high correlation with crew's thermal sensation is used and it shifts after that at the time of a stationary, the output of the 1st mutually related high temperature sensor will be used for an air-conditioning transient.

[0026] Moreover, if air-conditioning transients are Mohd other than vent mode or foot mode Since crew's thermal sensation and correlation become [the output of the 2nd temperature sensor] high when the difference of the temperature and target temperature which were detected by the 1st temperature sensor is smaller than the difference of the temperature and target temperature which were detected by the 2nd temperature sensor, this output is used. In being conversely large Since crew's thermal sensation and correlation become [the output of the 1st temperature sensor] high, this output is used. And if it shifts at the time of a stationary, the output of the 1st mutually related high temperature sensor will be used.

[0027]

[Embodiment of the Invention] Hereafter, a drawing explains the gestalt of implementation of this invention. In drawing 1 , the air-conditioning control device for cars assumes what is arranged inside the dashboard 1 of a car, the intake transfer device 5 which has the bashful inlet 3 and the open air inlet 4 in the maximum upstream of the air-conditioning case 2 is formed, and an introductory rate with the open air is adjusted by the intake door 6 as it is bashful. It is prepared so that the blower 8 which rotates by the motor 7 may attend said inlet, and by rotation of a blower 8, into the air-conditioning duct 2, air is attracted from an inlet, and it feeds to the downstream into it.

[0028] An evaporator 9 is allotted, and in the downstream of a blower 8, piping association is carried out with the compressor which is not illustrated, a capacitor, a liquid tank, an expansion valve, etc., and this evaporator 9 constitutes the air conditioning cycle, and cools to it the air which supplies a refrigerant to an evaporator 9 by operation of a compressor, and passes this evaporator 9.

[0029] The heater core 10 which makes an engine cooling water a heat source is arranged at the downstream of an evaporator 9, and the air mix door 11 is allotted before this heater core 10. The rate of the air to which the air which passed the evaporator 9 passes the heater core 10 by this air mix door 11, and the air which bypasses this is adjusted.

[0030] And air in which temperature control was carried out by the evaporator 9 and the heater core 10, It is ventilated at the outlet (differential-gear outlet 13a, vent outlet 13b, foot outlet 13c) empty vehicle room 14 opened and closed by the mode doors 12a and 12b prepared in the lowest style side of the air-conditioning duct 2. Here, it is open for free passage, respectively to lower outlet 17b by which foot outlet 13c which supplies air supplies air to a step to crew's step at up outlet 17a by which vent outlet 13b which supplies air to crew's upper half of the body supplies air to crew's upper half of the body.

[0031] Drive control of each air-conditioning equipment mentioned above is carried out by the control signal from a control unit 15, and this control unit 15 is equipped with the microcomputer equipped with CPU, ROM, RAM, etc., the input/output port of a signal, etc., changes various input signals into a control signal based on the predetermined program given beforehand, and controls each air-conditioning equipment.

[0032] Namely, up temperature sensor B which detects the temperature (Tr1) of the vehicle room upper part, lower temperature sensor C which detects the temperature (Tr2) of the vehicle room lower part, The signal of the temperature setter 16 grade which sets up the OAT sensor D which detects outside air temperature (Ta), and the target temperature (Tset) of the vehicle interior of a room is inputted into a control unit 15. Based on the various signals inputted here, To is calculated whenever [need blow-off temperature], and drive control of the various doors 6, 11, 12a, and 12b or the blower 8 grade is carried out so that it may be completed as target temperature (Tset) by whenever [vehicle room air temperature]. What is necessary is here, to arrange up temperature sensor B in the location near the head of crews, such as head lining, and just to arrange lower temperature sensor C near the foot outlet 13c of a dash panel lower part.

[0033] A process until it calculates whenever [of operation example / which controls each air-conditioning equipment by the control unit 15 to drawing 2 /, especially target blow-off temperature] is shown as a flow chart, and a control unit 15 goes into this manipulation routine after operation of an air conditioner, and inputs various information, such as vehicle room up temperature (Tr1), lower temperature (Tr2), outside air temperature (Ta), and target temperature (Tset), (step 50).

[0034] Although these various input will be used by each auto control of an auto air-conditioner At the process which calculates whenever [target blow-off temperature], while calculating the difference (|Tr1-Tset |) of up temperature and target temperature, and the difference (|Tr2-Tset |) of lower temperature and target temperature, the difference (|Tr1-Tr2|) of up temperature and lower temperature is calculated (steps 52 and 54).

[0035] When the difference (|Tr1-Tset |) of up temperature and target temperature or the difference (|Tr2-Tset |) of lower temperature and target temperature is large From the ability to be said that whenever [vehicle room air temperature] is the transient in early stages of air-conditioning which is not fully converged on target temperature Bordering on the predetermined value alpha, when said difference is larger than this, it distinguishes from a transient, and with alpha [below], it distinguishes further whether it is an air-conditioning transient or it is at the stationary time according to the difference (|Tr1-Tr2|) of up temperature and lower temperature (step 56).

[0036] Since it can say that it is at the air-conditioning stationary time which whenever [vehicle room air temperature] converged on target temperature when the difference of up temperature and lower temperature is small, if it considers that it would be in the steady state bordering on the predetermined value beta when |Tr1-Tr2| was less than [this], and larger [than beta] and it is still in a transient, it will distinguish (step 58).

[0037] When judged with current blow-off Mohd judging vent mode, foot mode, and other Mohd (bilevel mode etc.) (steps 60 and 62), and it being in vent mode, when distinguished from a transient, since crew's thermal sensation and correlation become high, the temperature around a head considers as whenever [vehicle room air temperature] with the temperature (Tr1) from up temperature sensor B, and performs future air-conditioning control. That is, To is calculated as To=f (Tr1, Ta, Tset, ...) whenever [need blow-off temperature], and Tr1 is the target temperature Tset. Drive control of the various doors 6, 11, 12a, and 12b or the blower 8 grade is carried out so that it may converge (step 64).

[0038] On the other hand, when judged with it being in foot mode by the transient, since crew's thermal sensation and correlation become high, the temperature of the leg circumference considers as whenever [vehicle room air temperature] with the temperature (Tr2) from lower temperature sensor C, and performs future air-conditioning control. That is, To is calculated as To=f (Tr2, Ta, Tset, ...) whenever [need blow-off temperature], and Tr2 is the target temperature Tset. Drive control of the various doors 6, 11, 12a, and 12b or the blower 8 grade is carried out so that it may converge (step 66).

[0039] Moreover, when judged with blow-off Mohd's being Mohd other than vent modes and foot modes, such as a bilevel mode, it is processed as follows. First, if it is in the transient of a bilevel mode If the difference (|Tr1-Tset |) of up temperature and target temperature is smaller than the difference (|Tr2-Tset |) of lower temperature and target temperature, correlation with lower temperature and crew's thermal sensation will become high, and if reverse If judged with it progressing to step 68 and being |Tr1-Tset |<|Tr2-Tset |, since it turns out that correlation with up temperature and crew's thermal sensation becomes high It considers as whenever [vehicle room air temperature] with the temperature (Tr2) from lower temperature sensor C, and if reverse, it will consider as whenever [vehicle room air temperature] with the temperature (Tr1) from up temperature sensor B.

[0040] Thereby, in a transient, since temperature control of the vehicle room is carried out by crew's thermal sensation and the temperature of a mutually related high part and it converges the temperature of the part toward target temperature according to blow-off Mohd with them, comfortable thermal sensation can be given to crew.

[0041] Air-conditioning progresses and it is completed as target temperature by the output of the temperature sensor chosen by each blow-off Mohd, and if it becomes at the time of the stationary which |Tr1-Tr2| becomes below beta at step 58, blow-off Mohd will change to a bilevel mode (step 70), and future control will be performed by relation with the up temperature to which correlation becomes high most with crew's thermal sensation at the time of a stationary. That is, To is calculated as To=f (Tr1, Ta, Tset, ...) whenever [need blow-off temperature], and Tr1 is the target temperature Tset. Drive control of the various doors 6, 11, 12a, and 12b or the blower 8 grade is carried out so that convergence may be maintained.

[0042] In the above-mentioned configuration, although it will become a bilevel mode if it results at the time of a stationary when set as vent mode by the transient, in this case, it is not concerned at a transient and the time of a stationary, but up temperature Tr1 is considered as whenever [vehicle room air temperature], and air-conditioning control is carried out. Moreover, the temperature sensor used while blow-off Mohd will change to a bilevel mode, if it becomes at the time of a stationary, although lower temperature Tr2 will be considered as whenever [vehicle room air temperature] in this transient and air-conditioning control will be carried out if set as foot mode by the transient also changes to up temperature sensor B, up temperature Tr1 is considered as whenever [vehicle room air temperature], and air-conditioning control is carried out.

[0043] And although there will be no switch of blow-off Mohd at this transient when the temperature of a side with the high correlation with crew's thermal sensation is used for air-conditioning control as whenever [vehicle room air temperature] and shifts at the time of a stationary if a transient is a bilevel mode, air-conditioning control will be carried out by only the up temperature Tr1.

[0044] Therefore, since air-conditioning control is performed referring to not only a transient but the temperature of the part to which correlation becomes high most with crew's thermal sensation at the time of a stationary, always spoiling crew's thermal sensation is lost.

[0045] Moreover, although modification actuation of target temperature etc. will be performed and it will get if crew's thermal sensation changes by switching blow-off Mohd since it is set as a bilevel mode no matter the transient may be set up by what blow-off Mohd at the time of a stationary In the above-mentioned configuration, since crew's thermal sensation is not spoiled by switching a temperature sensor appropriately, modification actuation of target temperature etc. becomes unnecessary and the troublesomeness which controls crew's air conditioner can be reduced.

[0046] In addition, although it was made to perform distinction of a transient and the time of a stationary using the factor of temperature, you may make it distinguish with the factor of only temperature, time amount, or time amount in the above-mentioned example of a configuration. As shown in drawing 3 , it replaces with said step 54. For example, the rate of change of up temperature, Or the rate of change of lower temperature is calculated (step 72), and when this rate of change is large, the vehicle interior of a room is in the early condition converged on target temperature. Since it can conclude that it is in the condition converged mostly when small, you may make it make the judgment of said step 58 substitute for the judgment which considers that the case where said rate of change is larger than the predetermined value gamma is a transient, and considers that the case of being small is a steady state (step 74).

[0047] Or a timer is started and the time check from the time of operation of an air conditioner is performed (step 76), and since it should be completed as target temperature by the vehicle interior of a room so that the time amount from the time of operation is long, you may make it make the judgment of said step 58 substitute for the judgment which it borders a timer on predetermined time delta, considers that the case of being shorter is a transient, and considers that the case of being long is a steady state, as shown by drawing 4 (step 78).

[0048] Although it cannot be overemphasized that the same operation effectiveness as the control which makes only temperature a factor is acquired even if it is in these control gestalten, it is desirable to assign the time amount delta on which in the control which makes only time amount a factor it decided in the experiment etc. beforehand according to vehicle indoor initial temperature, blow-off Mohd, etc. since the suitable switching time from a transient to a steady state changed with vehicle indoor initial temperature, blow-off Mohd, etc.

[Translation done.]

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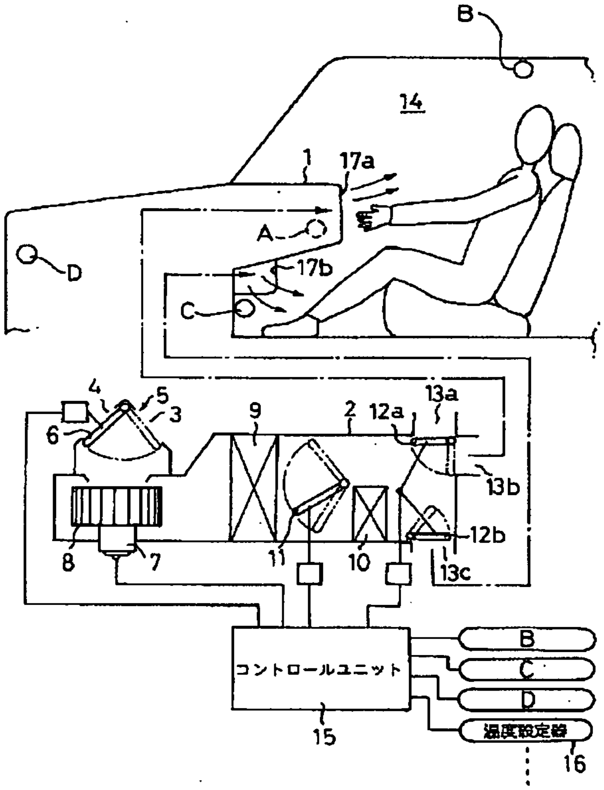
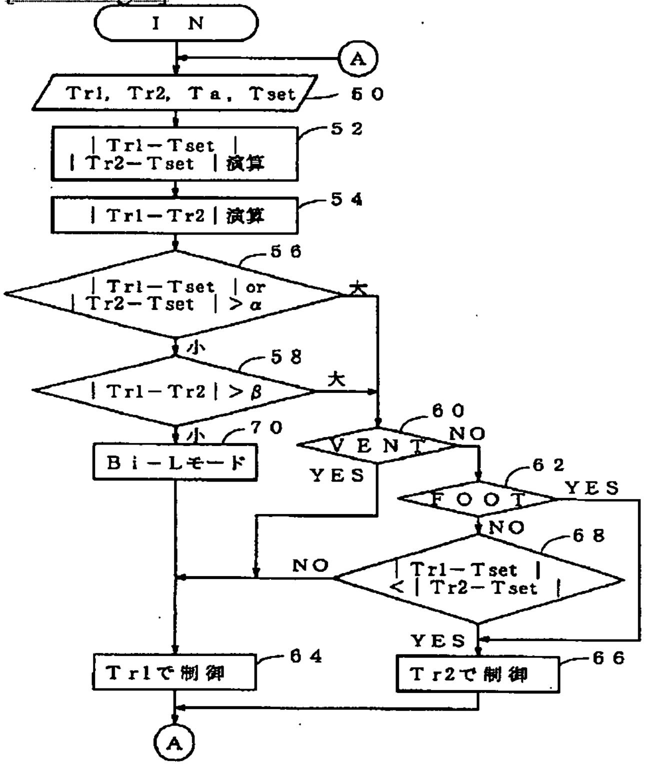
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] Drawing 1 is drawing showing the example of a hard configuration of the air-conditioning control unit for cars concerning this invention.
[Drawing 2] Drawing 2 is a flow chart which shows the example of control actuation of a control unit shown in drawing 1 .
[Drawing 3] It reaches.
[Drawing 4] Drawing 3 and drawing 4 are flow charts which show other examples of control actuation of a control unit shown by drawing 1 .
[Drawing 5] Drawing 5 is the characteristic ray Fig. having shown the outline of the temperature change of an air-conditioning transient according to blow-off Mohd about each at the time of air conditioning and heating.
[Drawing 6] Drawing 6 is experimental data in which the correlation of abdomen ambient temperature, head ambient temperature, leg ambient temperature, and crew's thermal sensation is shown.
[Drawing 7] Drawing 7 is the characteristic ray Fig. showing the relation between blow-off Mohd of an auto air-conditioner, and whenever [need blow-off temperature].
[Drawing 8] Drawing 8 is the graph which showed the outline of the correlation the abdomen ambient temperature A, the head ambient temperature B, the leg ambient temperature C, and crew's thermal sensation according to blow-off Mohd about each at an air-conditioning transient and the time of a stationary.
[Drawing 9] Drawing 9 is the characteristic ray Fig. showing the gap from the head ambient temperature B at the time of completing the abdomen ambient temperature A as target temperature (25-degreeC), and the target temperature of the leg ambient temperature C.
[Description of Notations]
15 Control Unit
16 Temperature Setter
17a Up outlet
17b Lower outlet
B Up temperature sensor
C Lower temperature sensor
D OAT sensor

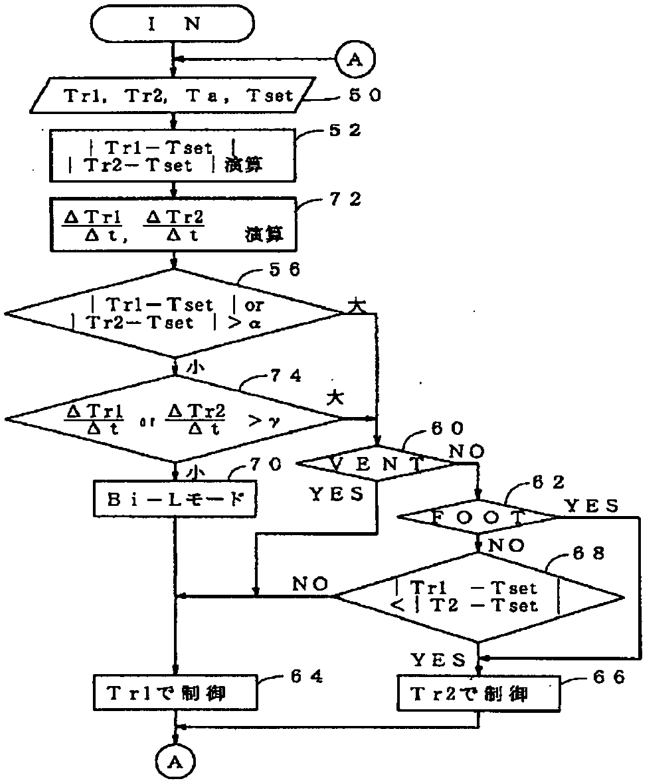
[Translation done.]



[Drawing 2]



[Drawing 3]



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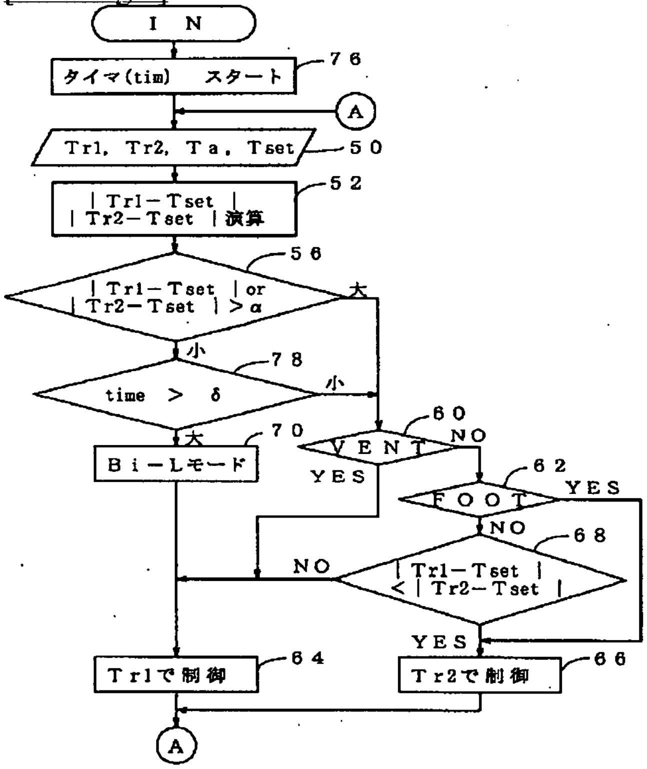
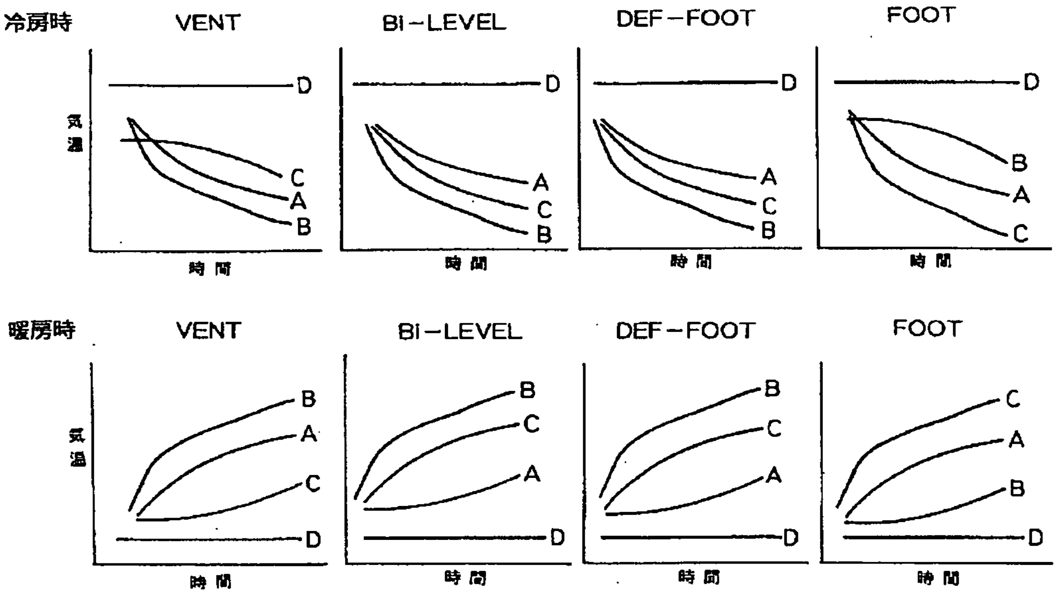
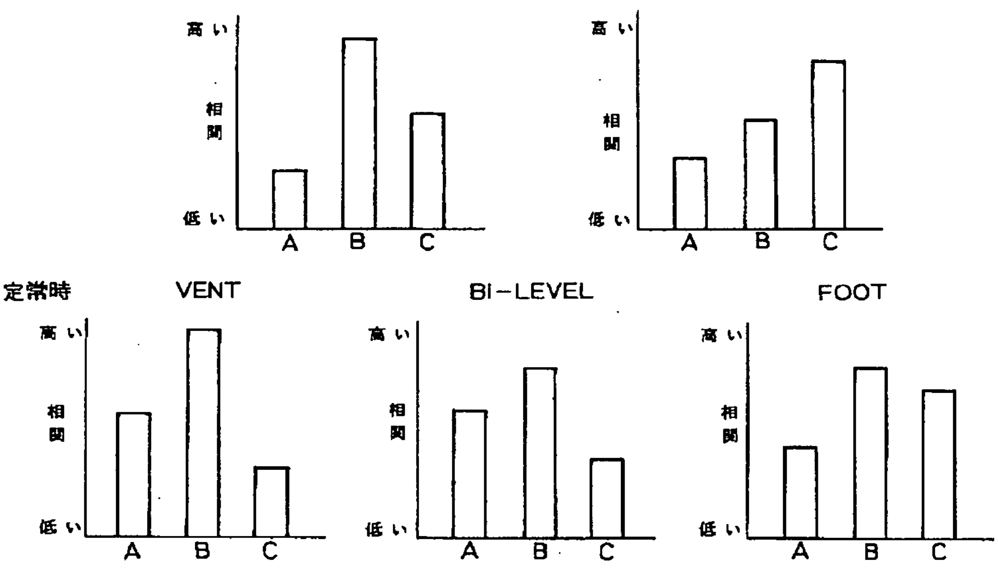


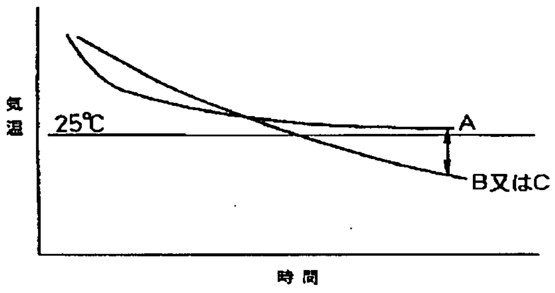
[Drawing 5]



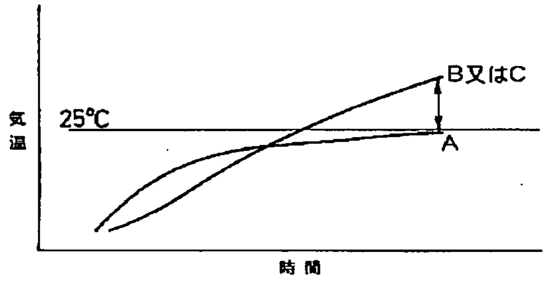
[Drawing 8]



[Drawing 9]



(a) 冷房時(25° C設定)



(b) 暖房時(25° C設定)

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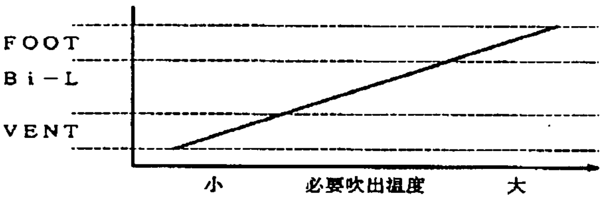
DRAWINGS

[Drawing 6]

実験条件	L H	L L	M H	M L
腹部周辺温度	0.886	0.388	0.946	0.291
頭部周辺温度	0.983	0.851	0.995	0.828
脚部周辺温度	0.936	0.977	0.934	0.951

LH：低速風量、上部吹出　LL：低速風量、下部吹出
MH：中速風量、上部吹出　ML：中速風量、下部吹出

[Drawing 7]



[Drawing 1]